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See Page 480

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EXPERIMENTER PUBLISHING COMPANY, NEW YORK, PUBLISHERS OF
SCIENCE & INVENTION - RADIO REVIEW - AMAZING STORIES - MONEY MAKING - RADIO INTERNACIONAL

Cunningham RADIO TUBES

SINCE·1915 STANDARD FOR·ALL·SETS

ALL·TYPES·C·AND·CX IN·THE·ORANGE AND·BLUE·CARTON

SOLID, SUBSTANTIAL
as to value---

DELICATE, PRECISE
as to performance---

That, in a nut-shell, is the reason why Cunningham Radio Tubes won the complete confidence of radio owners away back in 1915 and why they hold this confidence today.

Radio tubes face a most extraordinary task. They must have rugged strength—a strength that will endure through hour after hour of gruelling service. Yet they must also have accuracy that transcends all normal scientific standards. Cunningham Radio Tubes meet these exacting requirements year after year. By sheer merit, they have won their way into the sockets of America's finest radio receivers.

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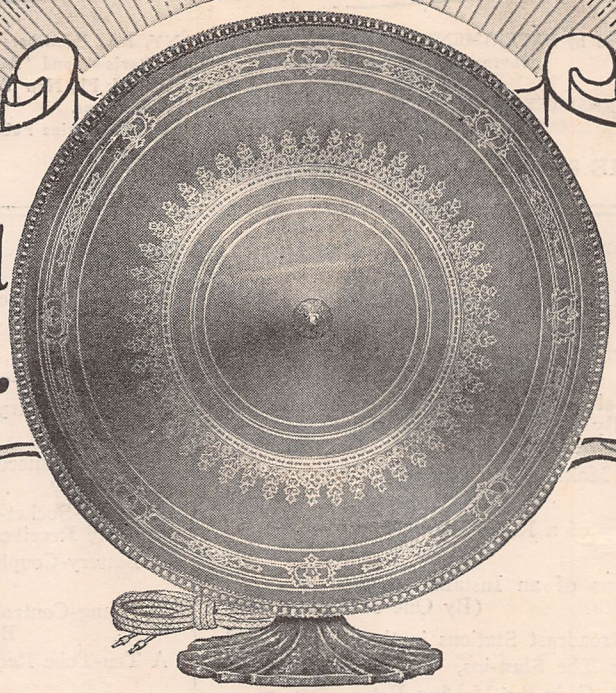
World's lowest priced Quality cone speaker



$9.50

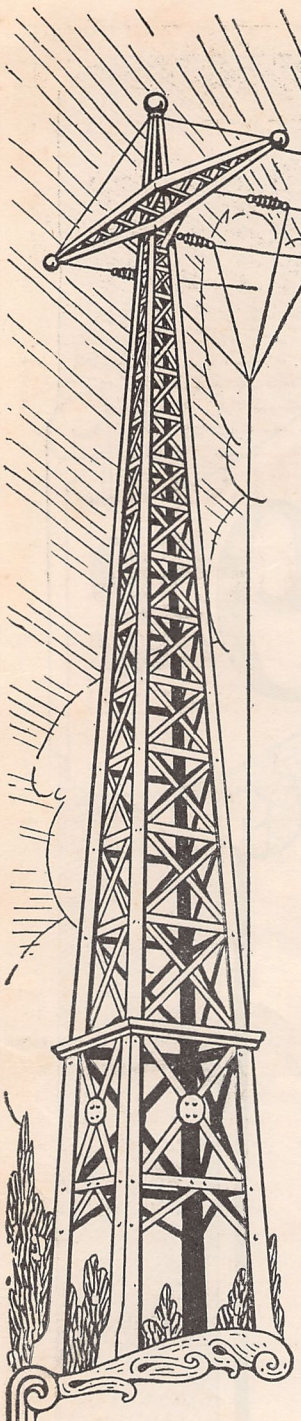
The Tower cone

WHEN the public was paying inflated prices for radio equipment in 1922, Tower inaugurated a sales policy revolutionary in the extreme. Instead of marketing a headset at a high price, the best possible pair of phones was designed, priced at *less than half* competitive prices, and then produced on a volume scale hitherto unknown. In an incredibly short time Tower became the world's largest exclusive manufacturer of headsets.

Today, with equal foresight, confident that highest quality at lowest cost is forever the "best policy," Tower offers a new Cone Speaker—the outstanding value in radio reproduction with all the quality of many speakers costing two or three times as much.

See and Hear the Tower Cone.
On sale from coast to coast.

TOWER MFG. CORP.
Boston, Mass.



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A VERSATILE SUPERHETERODYNE
By Leslie R. Jones

An ingenious application of the unit system to the construction of a receiver, by which trying out different hook-ups is facilitated for the constructor.

A SHIELDED-R.F. RECEIVER WITH AUTOMATIC BALANCING

Complete constructional data of a powerful and selective receiver, with option of transformer- or resistance-coupling in the A.F. stages.

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By C. A. Oldroyd

A useful and practical article which will be welcomed by the experimenter.

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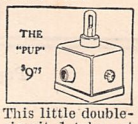
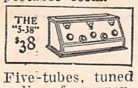
CROSLEY RADIO. All prices slightly higher west of the Rocky Mts.



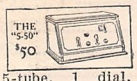
This little double-circuit 1-tube set has made long-distance records.

4-tubes, Amazing efficiency, Crescendon equipped!

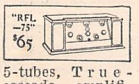
The 4-29 in portable form.



Five-tubes, tuned radio frequency. Two stages non-oscillating radio frequency amplification. Crescendon, two stages audio frequency amplification.



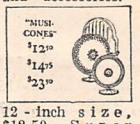
5-tube, 1 dial, acuminators, Crescendon, power tube adaptability.



5-tubes, True-cascade amplification; non-oscillating and non-radiating.

5-tube $50 instrument, Crosley Musicone speaker, ample compartment for batteries, solid mahogany console.

Double drum station selector! Musicone and room for batteries and accessories.



12-inch size, $12.50. Super Musicone, $14.75. Musicone Deluxe $23.50. Also beautiful console with room for batteries and accessories as below.

Embodies the Musicone in a beautiful console of two-tone mahogany finish and provides room for batteries and accessories. 24½ inches long inside.

One-dial control. You find your station, then write its letters on the graphic dial, locating it once and for all, to turn to whenever your fancy dictates.

The new Crosley all-metal shielded chassis not only aids in producing astounding selectivity, but standardizes manufacture and helps make possible the price of $50.

CROSLEY

BETTER—COSTS LESS

RADIO

One Dial Control!

. . . *in this amazing 5-tube set at $50*

Already the new 5-tube Crosley set, at $50, has met such a tremendous demand as to confirm the prediction that it will replace thousands upon thousands of sets now in use.

Confronted by high prices, many people who desired to replace their old sets have hitherto hesitated to do so. Now . . . in the new Crosley "5-50" . . . they find the features and qualities they desire, formerly exclusive to very high-priced sets . . . available at small investment.

The incomparable joys of Single-Dial Control! Uncanny selectivity, resulting from its metal-shielded chassis and the surpassing efficiency of the Crosley circuit's advanced design! Exquisite volume, thanks to the matchless Crescendon! Crosley Acuminators, power tube adaptability . . . all the attributes of radio at its best . . . for $50.

In all the Crosley line no instrument represents a greater triumph than this wonderful 5-tube set. Examine the line in full, as illustrated in the marginal column at the left . . . each item a victory for *mass production* in reducing radio prices. Then see the Crosley line at Crosley dealers . . . including the new "5-50" . . . now on display!

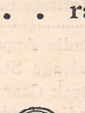
See it . . . hear it. View the refreshing beauty of its solid mahogany cabinet. Operate it yourself. Watch the stations, written in on the graphic dial, parade before you and usher in their programs with unerring accuracy. Sharpen the selection with the Crosley Acuminators. Release inspiring volume by means of the Crescendon.

Know what heights . . . in tone, volume, selectivity and sensitivity . . . radio of moderate price has reached!

$50

Slightly higher west of the Rockies. Never before, at anywhere near this price, has a radio set possessed all these advantages: 1. Single-dial control with graphic station selector. 2. Metal-shielded chassis, contributing to amazing selectivity and reducing cost. 3. Crescendon control, producing exquisite volume from distant stations. 4. Crosley Acuminators, which sharpen tuning and increase selectivity. 5. Power tube adaptability. 6. Beautiful, solid mahogany cabinet of distinguished design and exquisite two-tone finish.

THE CROSLEY RADIO CORPORATION, CINCINNATI — POWEL CROSLEY, JR. President



For Catalogue write Dept. 22

Crosley manufactures radio receiving sets, which are licensed under Armstrong U. S. Patent No. 1,113,149 or under patent applications of Radio Frequency Laboratories, Inc., and other patents issued and pending. Owning and operating station WLW, first remote control super-power station in America. All prices without accessories.

CROSLEY FEATURES

THE "CRESCENDON"

When, on ordinary radios, ears must strain to catch a station miles away, a turn of the Crescendon on Crosley radios instantly swells reception to room-filling volume.

An exclusive Crosley feature. ALL-METAL SHIELDED CHASSIS

This truly great radio achievement, found in several Crosley sets, furnishes a substantial frame for mounting elements, produces excellent alignment of condensers, shields the units from each other, prevents interstage, improves the stability of the circuit, increases selectivity and saves costs by standardizing this phase of manufacture.

THE SINGLE-DIAL STATION SELECTOR

Nothing in radio equals the joy or the convenience of single dial control. Crosley single drum control enables you to find the stations sought without log book or "tuning."

The "ACUMINATORS"

Crosley Acuminators provide sharp tuning where reception spreads broadly over dial, easily tune out local and bring in far stations. Ordinarily, once adjusted and they need not be touched again.

USE OF POWER TUBE

Power tube adaptability marks the Crosley "5-50", "5-75" and "RFL" sets. This feature typifies Crosley provision for best radio reception at moderate cost.

QUALITY AND BEAUTY IN CABINETS AND CONSOLES

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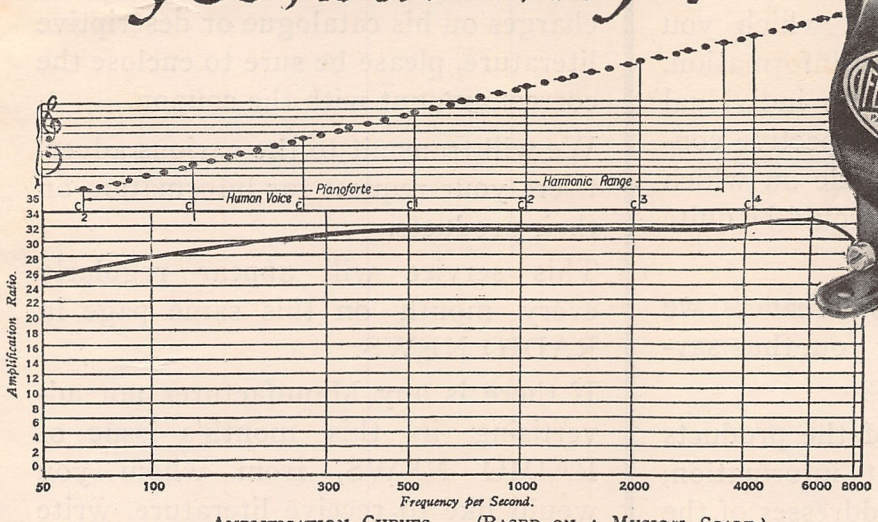
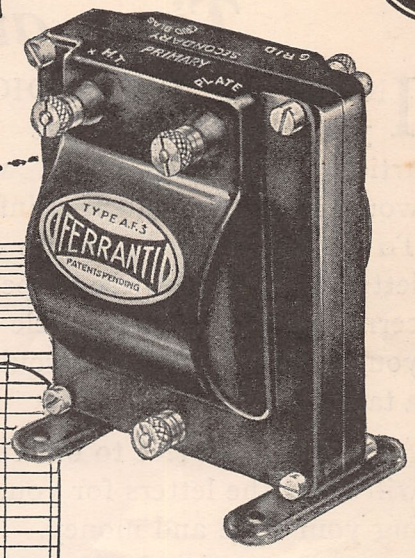
THE NEARLY PERFECT TRANSFORMER

FERRANTI

supreme —yes, but why?



AMPLIFICATION CURVES. (BASED ON A MUSICAL SCALE.)



Audio Frequency Transformer A. F. 3 $12

THIS graph is drawn on the musical scale—the only accurate way of showing the full value of each tone which your set receives. Note that the evenness and fullness of amplification extends throughout the range of the organ, the cello, and the human voice.

Analize these facts about the

FERRANTI TRANSFORMER

AFTER all is said, what is the truth about this transformer question? Is it important to you to get merely mediocre reception from your set, or do you value getting the very best from it that you possibly can?

The Ferranti Transformer is the Nearly Perfect transformer—nearly perfect because its amplification curve is almost a straight line. No other transformer approximates this degree of perfection.

And when you consider the fact that the scale of measurement is based on the musical scale, showing as it does true transformer value as applied to any tone which you can possibly receive in your set, you will appreciate that this is the only fair method of testing transformer performance.

The Ferranti Transformer does more than act as a superior transformer. It is designed to produce that depth of tone quality which is lacking without a worthy transformer. From the low notes of the organ and the kettle drum to the high pitch of the flute and the human voice, Ferranti Transformers "carry on" faithfully.

We welcome inquiries from responsible dealers and jobbers

No Better Transformer is Available at any price

FERRANTI, INCORPORATED

130 West 42nd Street , , New York, N. Y.

THE NEARLY PERFECT TRANSFORMER

RADIO NEWS READERS' BUREAU

Time and Postage Saver

IN every issue of RADIO NEWS you undoubtedly see numerous articles advertised about which you would like to have further information. To sit down and write an individual letter to each of these respective concerns, regarding the article on which you desire information, would be quite a task.

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Just write the names of the products about which you want information, and to avoid error the addresses of the manufacturers, on the coupon below and mail it to us.

If the advertiser requires any money or stamps to be sent to pay the mailing charges on his catalogue or descriptive literature, please be sure to enclose the correct amount with the coupon.

We will transmit to the various advertisers your request for information on their products.

This service will appear regularly every month on this same page in RADIO NEWS.

If there is any Manufacturer not advertising in this month's issue of RADIO NEWS, from whom you would like to receive literature, write his name, address and the product in the special section of the coupon below.

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TO: READERS' SERVICE BUREAU,
Experimenter Publishing Co., Inc., 53 Park Place, New York, N. Y.

RN-11-'26

FROM WRITE YOUR NAME and ADDRESS HERE:
NAME .....
ADDRESS ..... CITY, STATE.....

Gentlemen: Please advise the firms listed below that I would like to receive detailed information on their product as advertised in the.....issue of RADIO NEWS.

☞DO NOT USE THIS COUPON FOR TECHNICAL QUESTIONS

NAME	ADDRESS (Street — City — State)	List here specific article on which you wish literature.	If Catalogue of complete line is wanted, check in this column

☐ Check here if you are a dealer

Your Dealer's Name .....

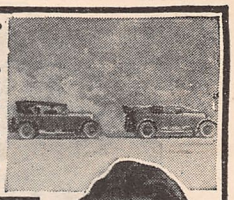
Address .....

Now Owns a Radio Store

"The Radio business is rushing just now. Building many Super Heterodynes, also doing installation and repairing. To your course I owe all my success in the Radio profession." A. J. Ommodt, Bowman, N. Dak.

Controls First Car by Radio

"I operate the portable broadcasting station in rear car, driving front car by Radio control. Will operate this car from New York to 'Frisco—13 months trip. Then we take the car around the world—a three years' tour. I owe it all to you." Leo Paul, New York City.



You Can Do What These Men Did!

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Make more money quick when you take up this practical course. I show you how to increase your earnings almost from the start of your course through practical pointers I give you.

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And when you graduate, my big Free Employment Department helps you get the job. You get just the same preparation and assistance toward success we gave C. C. Gielow, Chief Operator of the Great Lakes Radio Telegraph Co., E. W. Novy, Chief Operator of Station WRNY, Erie Chambers, Radio Engineer for Stewart-Warner, J. E. Fetzer, Chief Engineer of Station WEMC. The National Radio Institute, established 1914, today offers you the same opportunity these men had under a bond that guarantees you full satisfaction or money refunded. It's your big chance to get into the great Radio field—mail coupon TODAY for my big Free Book and proof!

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"I am in business for myself and **recently made $70 in one day.** I was an electrician of rich experience and was occupying a splendid position as telephone superintendent when I enrolled with your course believing it would open up greater opportunities—have not been disappointed. Estimate that Radio will be worth tens of thousands of dollars to me in the next few years." T. M. Wilcox, Belle Island, Newfoundland.

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Name.....Age.....

Street Address.....

Town.....State.....

Many will Start — But Few can Finish

IN the development of the radio industry, many have started but only those will finish who are building on a foundation of service which will stand.

IT is one thing to sell a radio instrument but quite a different matter to keep that instrument working perfectly in your home. Any new radio should deliver satisfaction but only trained service will keep it doing so—

In the rapid development of the radio industry the demand has been, in the past, generally more than the supply. It is only natural that little, if any, attention should have been paid to the one most vital requirement—trained service.

Four years ago Ozarka Inc. recognized the necessity of service—trained service, with the result, that now we have a trained service organization of 4364 men. One of these men is near you, ready and willing to deliver Ozarka service.

These men are not radio wonders who know all about all radio instruments. They make no claim to be able to service any radio instrument but they do know the Ozarka perfectly.

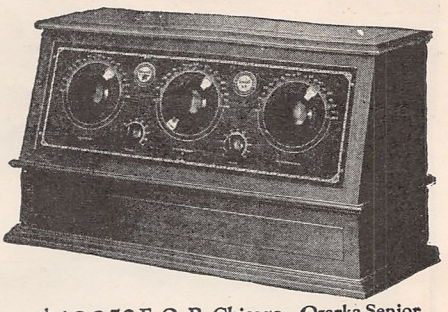
Radio is no different to any other mechanical device—sometimes little things will go wrong, serious to the owner, but very easily and quickly repaired by a trained service man who knows that instrument as he should.

In the mad rush of selling radio very little, if any, attention has been paid to service. A trained service organization requires time to develop and train—it has taken us four years to train 4364 men, who today constitute the Ozarka service organization.

Ozarka instruments are only sold by these trained service men by demonstration in your home—the only place where you can decide what a radio should do.

The Ozarka representative will gladly set up an Ozarka in your home. He will not operate it but let you do all the tuning. Only in this manner can you decide, if its tone, volume and ease of tuning is what you expect of a radio. Bring in station after station until you satisfy yourself of what it will do for distance, then discuss with him the most important matter of all—service—trained radio service.

OZARKA
TRADE MARK REGISTERED



$132.50 F. O. B. Chicago. Ozarka Senior 5 Tube Model complete with Loud Speaker and all accessories.
Also built in a 7 Tube Model

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We have a few Openings for the Right Men

WHILE there are today 4364 Ozarka representatives, some territory is still open. We want men who believe in the future of radio—men who are tired of working for some one else—men who would like to add to their present income by devoting their evenings to Ozarka.

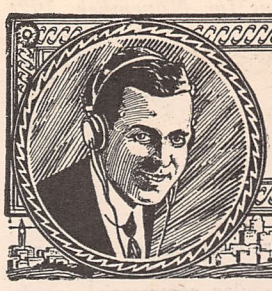
At the start you can keep your present position. Later on, after you have proven what you can do, then you will give us all your time because it will pay far more than your present position.

The man we want may not have much money but he is not broke. He has lived in his community for some time—he has a reputation that his word is good. He may not have made any startling success but he has never "put over something" just to make money. He may know nothing about radio or salesmanship but he will be successful if he is willing to study what we are willing to teach him, without cost.

The field in radio is wide open for the trained man. The success of the 4364 Ozarka representatives proves what men can do. If you are interested, ask for a copy of the Ozarka Plan, a 100 page book which tells a true story of how big money and a permanent business can be built in radio. It is a story of life; of why some men fail while others succeed. This book has shown many men how to start making extra money immediately and within a very short time establish a business of their own.

OZARKA
INCORPORATED

120 Austin Avenue A CHICAGO, ILL.



RADIO NEWS

HUGO GERNSBACK,
Editor and Publisher

EDITORIAL AND GENERAL OFFICES, 53 PARK PLACE, NEW YORK

Vol. 8 NOVEMBER, 1926 No. 5

COMING DEVELOPMENTS IN RADIO

By HUGO GERNSBACK

IT is well known that, for the past few years, no revolutionary improvements in radio or revolutionary radio inventions have been created. Old, well-tried-out, and reliable devices, which have been known to the art for many years, have been perfected gradually; and the development of radio receivers, today, may be said to follow very much along the same lines as that of the phonograph and the automobile.

It is this process of slow evolution that we may expect in the future, as well, and the old adage also holds true in radio: *"Natura non facit saltum"*—which, translated, says that Nature does not make jumps. In other words, all developments are part of a slow-moving plan of evolution. Even revolutionary inventions, when they do come along, will be found in the end to be not half as great a departure as they were thought to be at first.

When broadcasting was initiated, the prediction was freely made that radio would soon become a tremendous instrument for the purposes of education. It was foretold, on all sides, that every school would have radio outfits installed, by means of which the pupils would be instructed by lectures from a central place, where some men of great eminence would lecture, so that the classes all over the country would get the same information simultaneously.

¶ . . . in which the Editor points out that there have not been any revolutionary improvements in radio and it is likely there will not be any; wherein it is shown why lectures and talks of more than 15 minutes' duration are not popular; in which this is analyzed; that the reason for it is the static "mush" sound background, making listening difficult; and how it is hoped that in a few years this deficiency will be overcome . . .

While this idea is feasible in theory, so far it has not been put into practice; though the question is often asked by many people in all walks of life, "Why is there not more instruction and more education from our big stations?" Let us analyze the problem, and see what really is wrong. We find at once that very few stations today give any great number of lectures. If these are given, they are usually limited to fifteen minutes' duration, and very seldom run much longer. The broadcast directors seem to have acquired from experience the idea that a listener will not stand for longer talks than fifteen minutes; and many directors maintain that even this is too long.

On the other hand, the majority of listeners, when questioned, will tell you that they wish to be entertained, or that, if they do listen to lectures, these tire one too quickly. The latter statement is full of meaning for those who can read the signs aright.

Let us take a typical case. You sit in front of your loud-speaker and listen to a highly instructive, important lecture. Or, if you wish to observe scientifically, try it with one of your friends. Then watch his face carefully, and you will find that at no time during the lecture is he completely at ease. He has to strain to catch the words as they come from the loud-speaker, and very often an annoyed expression will come over his face. You can tell from his features that he is not being entertained. *It is really hard work, nowadays, to listen to any lecture,* throughout the greater part of the year. There are seasons when it is not quite so difficult; but we must be frank in admitting that during most of the time we would much rather listen to music, for we do not have to strain our attention to follow the motif, as we do when listening to a more or less dry lecture.

What is the reason for this? Let us presume that the radio set is not at fault, or, at least, not greatly. Let us also presume that we have a first-class loud-speaker, which reproduces perfectly. Then, what is wrong?

The answer is simple. Turn on your radio set at any time during the evening, and set it at a point on the dials where no station is audible. You will immediately notice a background of sound "mush," whose intensity depends greatly upon your location, the season, and many other conditions. If you are located in a great city, all the man-made static in the neighborhood will be collected on your aerial or loop, and will make itself heard in the loud-speaker. Every time some one lifts a telephone from its hook, every time some one rings a bell, runs an elevator, starts his automobile or tunes his radio, every time a trolley car passes by, and from many, many other similar electrical disturbances, a slight noise is produced in the loud-speaker.

Then too, atmospheric electricity makes itself known by even louder noises in the loud-speaker. Of course there is not always an abundance of static; but there is always some static electricity in the air, which, even during the best season, makes some impression upon the loud-speaker, loud enough to be heard.

The conglomeration of all these static noises comes out of the loud-speaker at the same time as the reproduced words; and in this fact the present deficiency of radio sets lies. We have no means as yet to stop this so-called static "mush," which blends with the transmitted voice, making it hard for us to understand perfectly the spoken word. The conditions are the same as if some one were speaking in a large room with every one else talking at low voice, making it almost impossible to understand the orator, or possible only with difficulty. At such a time, listening is no longer a pleasure, but becomes hard work.

In the modern radio set, furthermore, we have another producer of disturbing sounds, and that is the vacuum tube. Marvelous instrument that it is, the tube is not perfect, for nothing in this world ever can be. The radio tube, due to its inherent sensitiveness, also gives rise to characteristic sounds commonly known as "tube noises." Even without the static "mush" background, there are always noises produced by the tubes themselves. Every time a metallic particle is thrown off from the incandescent filament inside the tube, a noise is caused in the loud-speaker. There are various other tube noises, such as those produced by the slight jarring of the building in which the radio set is located, by temperature changes, etc. All of these causes give rise to some little current impulses, which, being amplified, produce a "noise level" of their own in the speaker.

As long as all of these disturbances prevail, it will be impossible to put on lectures that can be enjoyed by a very great number of people. While the imagination has to work hard to supply the missing words which the ear does not catch, studying by radio is too much of a task; and the public would much rather listen to music and other entertainment.

It seems to me that the greatest task of the radio engineer at the present time is the elimination of the extraneous, parasitic noises, which now issue from every loud-speaker over the whole world. Nor is the task hopeless. It seems possible that it can be accomplished by the use of correct filter circuits, installed in the radio sets. We already know that static, whether natural or man-made, is of a certain frequency; and it should be possible to suppress any such frequency by methods similar to those used today in our "A" and "B" eliminators, in which the hum and other undesirable noises are filtered out successfully.

Mr. Hugo Gernsback speaks every Monday night at 9 P. M. from Station WRNY on various radio and scientific subjects.

Television en Route

The "KAROLUS CELL" Betters Reproduction

By PAUL J. G. FISCHEL

THE day of Television is rapidly approaching; it will be with us very shortly. Several important inventions, made by German scientists, have practically removed the last difficulties in the field of "phototelegraphy" and have served to open a promising field of investigation. Though the developments made are still confined to the laboratory, the experiments conducted have been entirely successful and certainly indicate the practicability of the system.

I will explain in the following paragraphs the new "phototelegraphic" apparatus worked out by the Telefunken Co. in Berlin, with which tests were carried on between Königswusterhausen, near that city, and Vienna, the capital of Austria.

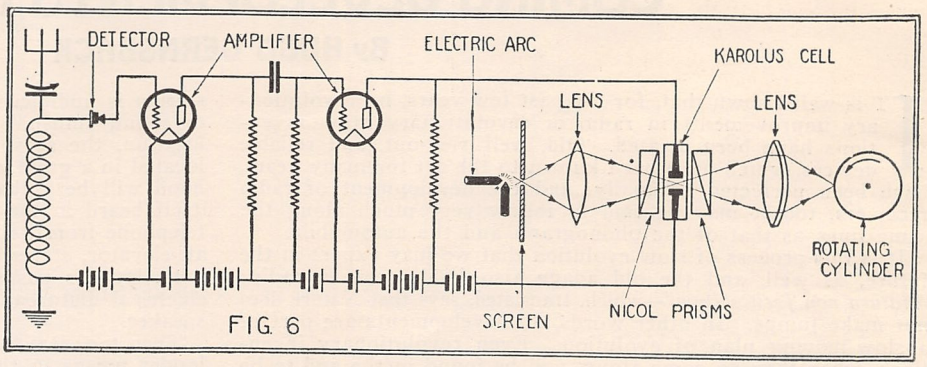
THE SPEED PROBLEM IN COMMERCIAL RADIO

Present forms of automatic radio telegraph systems permit a transmission and reception speed not greater than 100 to 150 words per minute, and sometimes much less, as the actual speed depends on atmospheric conditions. Bad atmospherics partly or entirely destroy the telegraph signals, and for this reason high-speed communication is greatly hindered.

The Telefunken system of phototelegraphic transmission is far more reliable, as it is practically independent of atmospheric conditions. Static and other forms of electrical disturbances cause only small black dots and thin lines on the received photogram, which in no way detract from the legibility. Not only is this new system more reliable, but it is far superior to present automatic systems, as it is possible to attain a transmission and reception speed of 400 to 600 words a minute.

The speed of the system can be materially increased if the transmission and reception is done on a short wave-length, less time being required in such an instance for the complete transmission and reception of a photogram of a given area. In fact, it has been found possible to transmit 400 words within the space of a few seconds. About 16 square inches are required for 200 words, and two or three times this area is reproduced in a minute, at regular commercial speeds.

So well does this system retain the formation of the original script transmitted that the received photogram can be used immediately for reproduction in newspapers or magazines, whether it be of handwriting, type, a photograph or a sketch. Of course, where exactness is demanded in the transmitted material, such as scientific sketches or photos of artistic value, the weather conditions must be favorable; as it can be seen that small dots or thin lines might be ruinous to the reproduction at the receiving end.



The receiver circuit. Notice how the plate of the last vacuum tube is connected to the condenser of the Karolus-cell. The variations in the plate current cause a corresponding change in the transparency of the cell, by the phenomenon of polarization.

ADVANTAGES OF THE TELEFUNKEN SYSTEM

Various systems of phototelegraphy now in use in Europe and America have reached a high point of development; but there are two distinctive advantages which go to explain the superiority of the Telefunken system. The first is the possibility of sending from the original telegraphs directly, without any form of photographic or other preparation; the second the very high sending-speed, coupled with the perfect quality of reproduction.

The improved operation of the transmitter is attributed to the new ring-shaped photoelectric cell developed by Dr. Schröter of the Telefunken Co. (See Fig. 1). The high speed and quality of reception is made possible by the light relay invented by Dr. Kar-

At the left is an unretouched reproduction of a photogram of the German radio engineer, Count Arco, a director of the Telefunken Wireless Co. This portrait was transmitted by the process described in this article from Königswusterhausen, which is near Berlin, to Vienna.

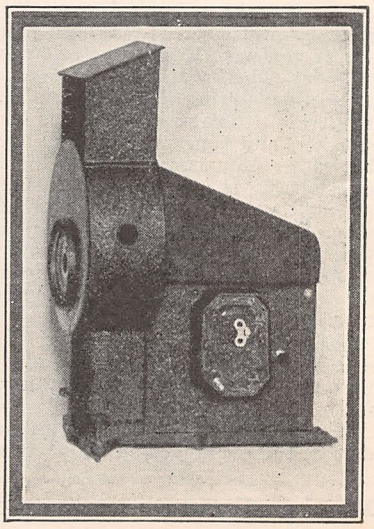


Fig. 3A. This is the electric-arc projector of the transmitter shown in Fig. 3 (opposite page). Its intense ray is thrown upon the projecting object lens (See Fig. 4) and passes through the tiny "pupil" of the "electric eye" — the photoelectric cell of Fig. 1. It is then reflected with varying intensity (depending on whether it falls on an area black, white or grey) from the spot on the mounted telegram on which it is focused, to the coated surface of the photo-electric cell. The variation of current thus caused is used after amplification to modulate the transmission.

olus of Leipzig, called after him the "Karolus Cell." (See Fig. 2). It makes practical use of what is known as the "Kerr effect," and is entirely free from mechanical inertia in its operation.

THE TRANSMITTER'S "EYE"

The transmitter consists of a large cylinder enclosed in a light-proof box (See Figs. 3 and 4). An electric motor rotates the cylinder and at certain intervals changes its lateral position. On the cylinder is mounted the telegram or photo to be transmitted. The light from an electric arc is concentrated on the face of the cylinder by means of a system of lenses. The photo-electric cell or "optical microphone" is mounted between the arc light and the cylinder so that the concentrated light rays have free passage through the center of the ring-shaped electrode.

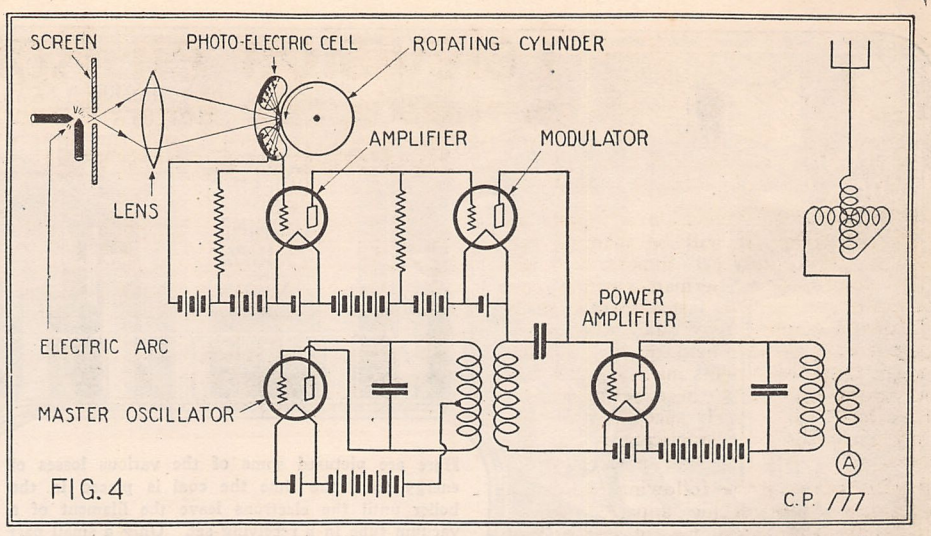
The spot of light thus directed on the telegram is only .008-inch square, thus covering a mere thread-line of the cylinder surface. The rays of light reflected from the cylinder strike the outside surface of the ring-shaped cathode of the photo-electric cell and affect the potassium coating, which emits electrons when exposed to light, in exact correspondence to the light and dark spots on the telegram traversed by the ray of light.

The anode of the photo-electric cell is formed by a grid of fine wires which readily allow the reflected rays of light to pass through to the cathode, but take up the electrons emitted by the potassium. The variations of current thus created in the circuit of the cell are passed through suitable audio-frequency amplifiers and in turn modulate the radio-frequency currents generated by the transmitting tubes.

THE KAROLUS CELL

The same arrangement of cylinder, driving motor and electric arc is used at the receiving end. (See Figs. 5 and 6). The rotation of the receiving and transmitting cylinders is brought into synchronism in a very simple and ingenious manner; no transmission of separate synchronising signals is required.

An unretouched reproduction of a photogram, which was sent by the process described in the accompanying text.



Above is shown the circuit employed in the transmission of pictures by radio. Notice the peculiar construction of the photoelectric cell and its connections.

Again several lenses concentrate the rays of the electric arc towards the surface of the enclosed light-proof cylinder, on which a negative film is mounted. With the system

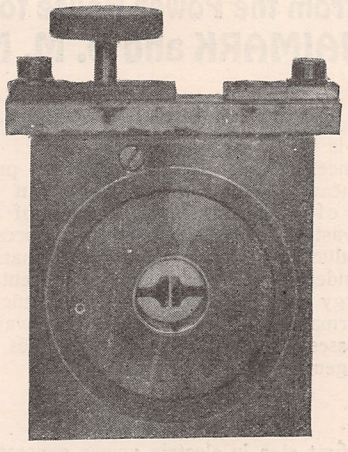


Fig. 2. The Karolus-cell. Note the two condenser-electrodes inside the glass cell and the terminals for connection to the receiver. The handle allows adjustment of the electrodes.

of lenses is incorporated the sensitive light-relay, the Karolus cell, which is connected to the output of an audio amplifier, following the radio receiver. The modulations of the transmitter's carrier wave thus cause amplified potential changes across the two electrodes or condenser plates in the Karolus cell. The cell itself is formed of glass and filled with carbon disulphide. The rays of light which have to pass the cell, that is to say, the small space between the condenser plates, are previously *polarized* by suitable Nicol prisms. Due to the already-mentioned "Kerr effect," the polarization plane of the light rays is rotated or twisted in accordance with the potential changes across the condenser plates. This varies the intensity of the light leaving a second pair of Nicol prisms following the Karolus cell.

The rays controlled by the cell are now directed, point by point and in thread-lines of exactly the same dimensions as in the transmitter, upon the reception film, forming a negative from which any desired number of positive prints may be made.

As the Karolus cell is entirely free from mechanical inertia it can handle a nearly unlimited frequency of applied-potential

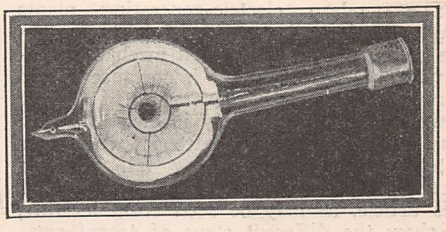


Fig. 1. The photoelectric cell invented by Dr. Schröter. Note the potassium cathode on the inner glass surface, the grid-anode and the hole in the center of the ring.

changes. The cell will also handle an enormous intensity of light without overheating, because of its small size, so that it is especially suited to television work.

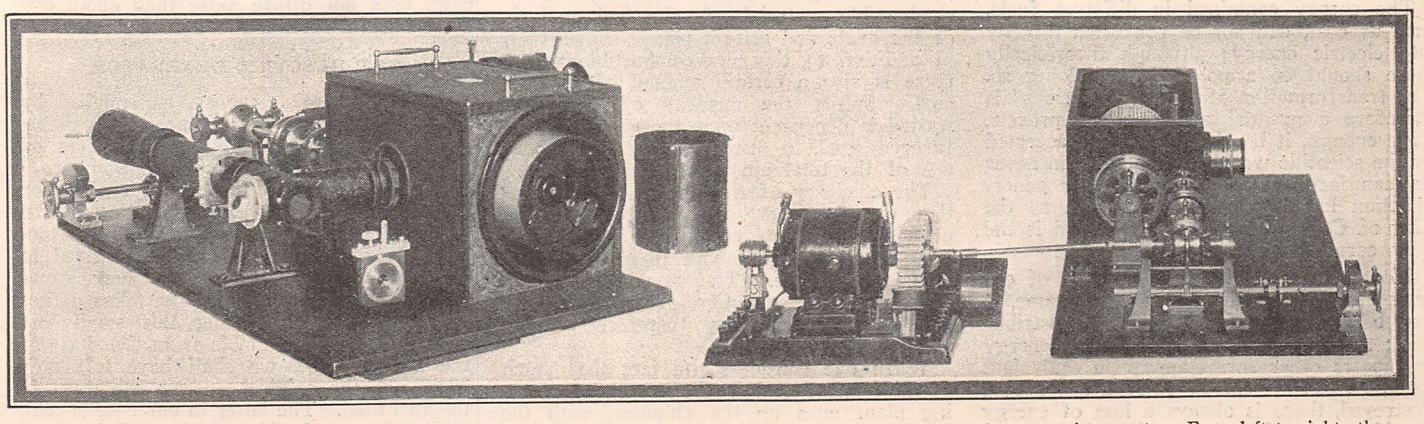
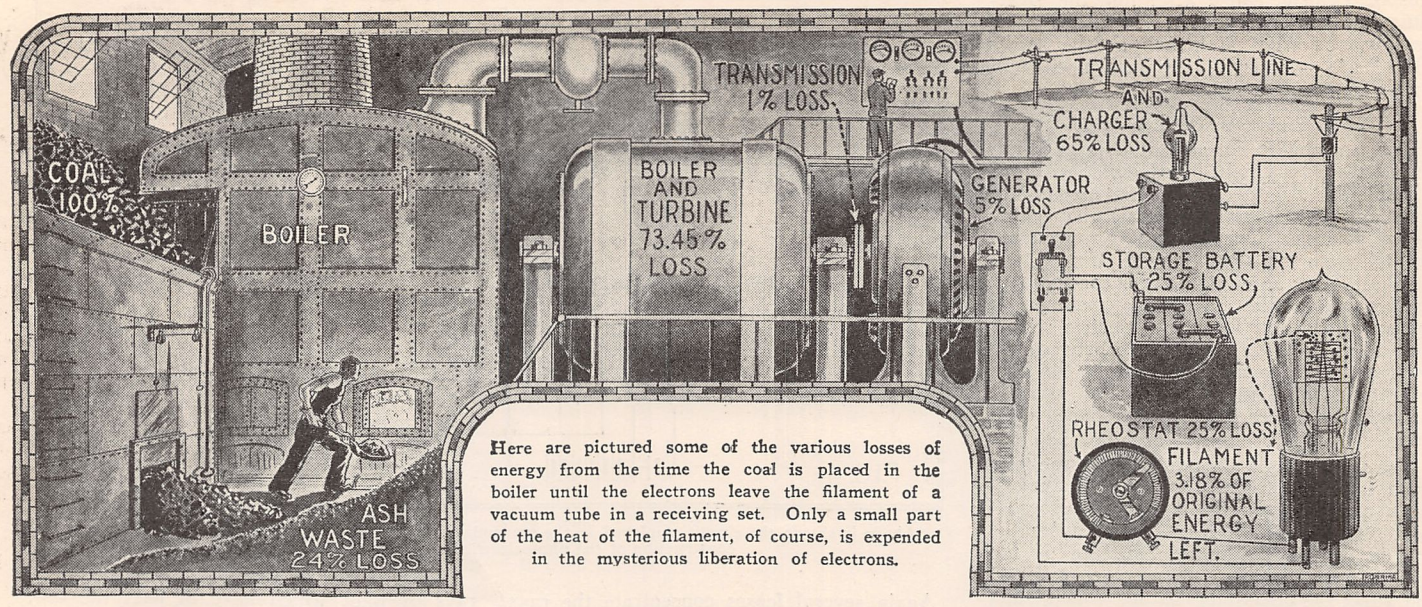


Fig. 5. The Telefunken-Karolus receiver system showing at the right a cylinder on which the unexposed negative film is mounted. One Karolus-cell may be seen in position in the center of the optical device and one standing in front of the receiving cylinder case.

Fig. 3. The Telefunken-Karolus transmitter system. From left to right: the electro-motor for driving the cylinder, the synchronising device, the transmitting cylinder showing a mounted telegram (a part of the photoelectric cell may also be seen), and a system of lenses concentrating light from the electric arc upon the cell.



Here are pictured some of the various losses of energy from the time the coal is placed in the boiler until the electrons leave the filament of a vacuum tube in a receiving set. Only a small part of the heat of the filament, of course, is expended in the mysterious liberation of electrons.

From Coal to Electrons

Tracing the Energy from the Power House to the Vacuum Tube

By BORIS S. NAIMARK and D. M. MORANDINI

IT is generally known that the operation of the modern radio tubes is dependent upon electronic emission. It is equally well known that this electronic emission takes place at comparatively high temperatures. The emitting element of the modern radio tube is its filament; and the necessary filament temperature as required by operating conditions is, in the standard receiver, supplied by a storage battery, commonly designated as the "A" battery.

The modern electric-generating plants employ coal as the source of heat, producing steam pressure and then mechanical energy. These are of vital importance in the various stages of the generation of electric power, which is necessary in order that we may charge our storage batteries when their potential and stored energy fall below a certain definite value. It is the purpose of this article, as may be seen from its title, to show the different steps of transformation of the original energy contained in the coal (which is the standard fuel in modern power generating plants) into the heat energy, applied to the filaments of our tubes, so that electronic emission may take place; and, above all, to show what tremendous power losses are involved in this conversion of "coal to electrons."

ENERGY NEVER DESTROYED

The energy contained in different fuels, such as coal, can not be converted directly into electric energy; although theoretically there should be a possibility of doing so. The transformation of "coal to electrons" is therefore a gradual and wasteful process. True enough, it has been generally accepted by the scientific world that energy can never be manufactured or destroyed. This generalization has become to be known as the Law of Conservation of Energy, and is the very cornerstone of modern physics.

However, while the total quantity of energy in the universe is always the same, it may be changed in form as well as distribution; that is, whenever one form of energy disappears other forms appear in equivalent amounts. While energy as such can not be destroyed, there is always a loss of energy manifest; this loss is not in the form of annihilation, but in the form of dissipation, part of the energy being diffused. Thus it can be seen that while there is no diminution in the total quantity of energy in the universe, some of it slips from our control and becomes no longer available whenever energy is used or transformed.

Engineering furnishes scientific and practical means for determining with an approach of precision the proportion of energy waste involved in different processes of production and energy transformation. The tendency is to decrease the percentage of energy wasted under any step of energy transformation. Despite this, the wastes and losses in the ordinary processes of power generation are very large.

IN THE FIRE BOX

The first step in electric power generation is the combustion of the coal under the boilers. This is the transformation of the potential thermo-chemical energy of the coal into the gases used in the furnace. The efficiency of this process, sometimes referred to as "gasification", is not exceptionally high.

It must be said that the quantity of coal burned never represents the actual quantity of combustible material, since in all coals there is a certain percentage of absolutely non-combustible ash. Statistics show that, for every 100 pounds of coal placed in a furnace, approximately 18 pounds will remain on the grate and in the ash pit as incombustible material. A chemical analysis of the grate and ash-pit refuse shows that, in addition to this non-combustible waste, there is also a certain amount of unburnt coal. While the quantity of coal thus wasted is dependent upon the nature of the furnace used, it usually represents about 6% of the total amount of coal used.

The efficiency of the process of gasification can be very easily computed. 100 pounds of dry coal put in the furnace will leave in the ash pit about 18 plus 6, or 24 pounds of waste. The remainder, or 76 pounds, is the quantity of coal actually gasified. The efficiency therefore will be about 76%.

When one considers the fact that much of the heat of coal in the average generating plant goes up the chimney, with the smoke and gases, this efficiency of gasification is fairly high. Under actual operating conditions the efficiency of the process of gasification seldom exceeds the above figures.

BOILER AND ENGINE LOSS

The coal having been gasified, we must now utilize the heat generated in the furnace for the evaporation of water in the boiler; we must transform the heat resulting from the combustion of the coal into the expansive energy of steam. A certain amount of energy will be dissipated in this second process of transformation, the efficiency of which is that of the boiler used. The efficiency of modern boilers is from 60% to 75%.

The volume or pressure energy of the steam, developed by the boiler, is next converted into mechanical energy by means of a steam engine. This third step in the process of electric power generation is responsible for a great deal of dissipation of energy.

Considering the losses in the above-mentioned processes, it will be readily seen that only about 20% of the energy, originally contained in the fuel, is transformed into useful work. However, when high pressures, temperatures and modern turbines are employed, as is the case with most large generating plants now in use, this efficiency may be as high and even slightly higher than 25%. In this statement we are considering the more favorable conditions of power transformation. The ordinary locomotive, however, does not utilize more than about 8% of the useful energy of the fuel.

THE ELECTRIC GENERATOR

Once the motive energy, as supplied by the steam engines or turbines, is available it can be employed for the generation of electric power; this is accomplished by connecting dynamos to the steam engines or turbines, employed in the generating plants.

Not all of the motive energy of the turbines or steam engines can be imparted to the dynamo. The actual loss here, however, is very small and may be taken as not exceeding 1%. Deducting this small loss from the energy available from the shaft of the steam-engine, we shall have left only 19.8% of the original energy contained in the fuel used. The latter in our case is coal.

The dynamo itself is a very efficient machine. The efficiency of the most modern types will be about 95%, and the loss 5%. Considering this loss we will have left only

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Radio Is Making Us "Ear-Minded"

How Broadcast Listening Is Improving Our Sense of Hearing

By CHARLES M. ADAMS

DURING the last five years, practically every phase of human interest and activity has been affected to a greater or less degree by radio broadcasting. Such significant things as music, religion, education, politics, sport, the drama, home life itself—to mention only the most outstanding—have been offered new possibilities or undergone extensive readjustments. It is probably because of the absorbing interest in these more or less outward changes, rather than in spite of them, that most of us who make up the radio audience have gone our way unmindful that broadcasting has also brought about a change of considerably more intimate character in each of us. I refer to an alteration in our psychological makeup.

If you were told you were to be deprived one of your five major senses, and were asked to name the one you can least do without, your choice would unhesitatingly be sight. Sight has for centuries occupied the place of overwhelming predominance among the senses. Not by chance is it by far the most used and useful, but for sound scientific reasons.

WHY SIGHT IS PARAMOUNT

It has the best equipment. The nerves which connect your eyes with your brain are many times more complex than those which connect your ears with your brain. That is why, at such a place of din and bedlam as a football game, the strongest impression you carry away is one of color and movement—things seen.

More than that, sight has a range many times broader than hearing. If you stand on a skyscraper or a mountain top you will see considerably farther and with a broader scope than you can hear. Some sounds will reach you, of course, but they will be insignificant and close at hand, compared to what you see.

Further, sight is infinitely more *selective* than hearing. Have you ever tried to use a telephone in a crowded hotel lobby or office full of clattering typewriters? If you have, the chances are that you had to guess at half what the person at the other end of the line was saying. Yet in the same places, with colorful people and surroundings to look at, you would have no trouble reading. To put the thing in radio parlance, *sight tunes more sharply than hearing.*

Besides, you can remember what you have seen several times longer than what you have heard. If you have a friend you have not seen for, say, four or five years, you will find you can recall his or her features without trouble. But when you try to recall the sound of his or her voice, you will get nothing but a faint general impression.

You can see now why you put *sight* to such an endless variety of uses in every-day life, even—this is where the senses begin to play pranks—when *hearing* is what you think you are using.

"HEARING" BY SIGHT

The next time you are talking to a friend in a car full of people or a noisy restaurant, and "hearing" him perfectly in spite of the interference, close your eyes or turn your back. You will find to your surprise, that you can no longer hear him distinctly; and thereby be reminded that you were "reading his lips," rather than listening to the sounds they were forming.

That is only one example of how, because sight is a superior sense in efficiency and equipment, we have unconsciously let it do much of the work we think we have delegated to hearing.

Do you remember the first time you talked over a telephone? You probably finished—if you finished—declaring loudly the thing wasn't practical, that you couldn't hear. The trouble was, of course, that you had been unconsciously letting your eyes do so much of your hearing for you, that when you were forced to depend on your ears alone you had to make a radical readjustment.

The same thing happened again when radio came along. If you recall the first time you listened in, you will probably remember that you kept your eyes fixed intently on the loud speaker, trying unconsciously to hear by sight.

This, then, is what the psychologists mean when they say practically everyone endowed with normal senses is "eye-minded". Most people not only make more use of sight than they do of hearing (even when hearing is the sense they suppose they are using) but think in terms of sight of things which could just as logically be thought of in some other way.

Has radio changed this? Decidedly.

RADIO EDUCATES LISTENERS

Here is the situation. You can't do anything but *hear* by radio. The engineers tell us we'll be able to see in a few years. But since broadcasting started the only way we have been able to get the programs has been by hearing; and more than that, *hearing with our ears only.*

Looking at the loud speaker has not helped. Watching the panel or tubes or transformers or batteries has not helped. The only way we have been able to take in what the broadcasters have been putting out has been through the ears. The result has been that these organs, pretty much ornamental (more or less) in most every-day uses, and mere auxiliaries at best, have been given more work to do in the last five years than ever before—bringing us music, speeches, plays, lectures, the whole varied offering of broadcasting. What is more to the point, radio has made us really hear with our ears.

While you had formerly, as you thought, to keep your eyes glued to the speaker to get what was coming in through the ether, you can now read, look at something else, even turn your back on the set, while you keep right on hearing just the same.

Music has come to mean more to you as *music.* Did you ever notice at a concert that the orchestra became soft as much because you saw the director signal "pianissimo," as because the volume was actually less? That was why, when you first began listening in, you complained that broadcast music did not have the shadings of expression you found in music heard direct.

But now these shadings register completely, through the ears, without any help from the eyes.

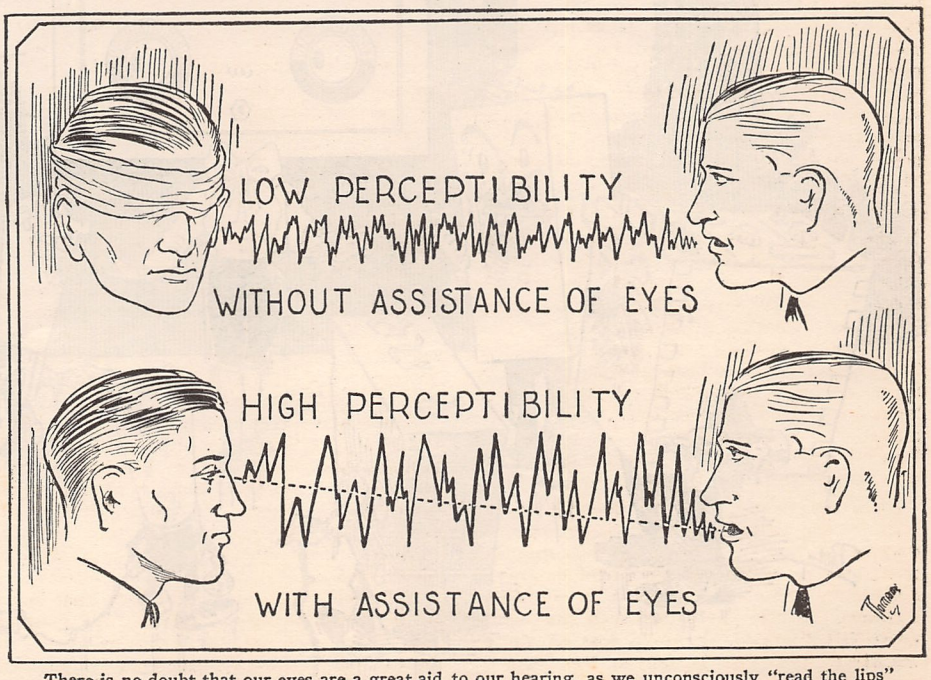
CULTIVATING THE IMAGINATION

Broadcast plays have come to mean more. At first you were not convinced by simply hearing the sweet voice of the heroine and the stalwart replies of the hero. You said "That's not like seeing them on the stage"—mainly because you had always been used to *seeing* them on the stage. Now you listen till the last word and get a genuine kick out of these same voices.

Church services have come to mean more. Before you had trained your ears to do the work for which they were originally designed and which the eyes had usurped, stained glass windows, gothic architecture, and handsome pews put you in the mood for worship, even more did than the deep peal of the organ and the solemn chant of the choir. But now these things alone, coming out of your loud speaker, bring just as much of the atmosphere of the church.

In other words, after a long period in which, without knowing it, you were psychologically lop-sided—that is, just eye-

(*Continued on page* 530)



There is no doubt that our eyes are a great aid to our hearing, as we unconsciously "read the lips" of the person speaking. Make the test indicated above for yourself and be convinced. "Your Eyes Hear."

The Diary of a Radio Receiver

Wherein a good set had a bad time of it until . . . .

By M. W. MITCHELL*

I'LL never forget my first coherent thoughts. When I became conscious of events, a young fellow was giving me a final examination to see that I was properly wired and every joint firmly soldered. After what seemed to me an unnecessarily critical examination, he finally pronounced me O. K.

I was then placed on another bench where I found a great many receivers identical in appearance to myself—to my great surprise, as I had believed myself to be the only one in existence.

The main theme of conversation seemed to be centered on some fearsome ordeal they were yet to undergo—some sort of a test. I felt quite superior and informed them in lofty tones that I had passed all the tests. Oh! how they laughed.

Finally one of them told me that I had the appearance of a very fine receiver; but before I could leave my "home" to take my place in the world, I'd have to prove by actual performance that I was of thoroughbred stock.

Said my kindly informant: "When a receiver from this laboratory finally receives the chief's O. K., you can be mighty certain it has quality built into it throughout, not only looks good, but has wonderful tone quality, selectivity and dependability in its entire system."

I PROVE MY WORTH

That evening the real test came; the factory was silent—only one or two lights burned dimly. Suddenly I was picked up and placed on what the man called a "test bench"—two little wires were attached to my "aerial" and "ground" terminal posts, (I had been wondering what they were for) but I could feel no particular sensation. Then the tester picked up what he called a battery connector cable. A friend of his was standing nearby and he remarked that they always used a good cable, with different colored leads, because it absolutely prevented the possibility of wrong hook-ups and burned out tubes. (I began to regain a little of my self-esteem, which my brother receivers had destroyed by their laughter during the afternoon, and figured I was pretty nice, or they wouldn't be using the very best materials on me).

The tester then placed five queer looking glass tubes in my sockets, and I wondered what was coming next. A sudden click of a switch, and oh! I can't describe the feeling of pent-up power, and desire to do things, which suddenly permeated my entire structure—it seemed that great things were on the point of taking place. Then a twist or two of my dials, and words cannot picture the wonderful sounds which filled the room. It was several minutes before I realized the beautiful sounds were issuing from the throat of a queer-looking horn connected to me by a little wire.

The tester's friend then spoke: "Well, Joe, you've certainly proved your case with me. I'm a musician and have always believed it was impossible to do what you've done. You have reproduced *perfectly* strains of music and voices from a studio hundreds of miles away. It certainly is a wonderful receiver."

"Yes, the receiver is a beauty," said the tester: "but make no mistake, it is just as important to use good accessories as it is to have a good receiver. If we used a cheap, inefficient speaker, poorer tubes, and didn't take care to see that our batteries were in good condition, our performance wouldn't have been so good."

Finally the tester pronounced me O. K. and said: "The man who buys this radio receiver will certainly be acquiring one of the best."

All the little wires were then disconnected and the wonderful feeling left me. I called to them to hook me up again—I didn't want ever to be without the little wires and batteries—but they didn't seem to hear me. Soon I was carefully packed into a little box, and for a time everything was blank.

I FIND AN OWNER

When next I saw the light it was under entirely different circumstances than at the factory. When lifted from my box I was in the coziest little room imaginable. There were some of the little batteries and wires there, too. "Ah!" I thought, "this must be the lucky man who bought me. Now I'll show these nice-looking people just what I can do. Gee, they'll be proud to own a radio receiver like me."

Then they hooked the little wires to me, but they did it much more slowly, and frequently examined a little paper to see they were doing everything properly. I could hardly wait.

The man was talking and I paid very close attention, since we were to be together for a long time, and he was going to be so proud of me.

Said he: "Well, I paid a little more for the receiver than I intended to (a little thrill ran through me—I was such a good receiver people were willing to pay a little extra to have me) but I made up for it on the accessories. The dealer tried to sell me batteries, tubes and a speaker for the set, but he wanted too much money. I walked down to the next block and—would you believe it?—I bought all the accessories for just about half of what the dealer wanted to

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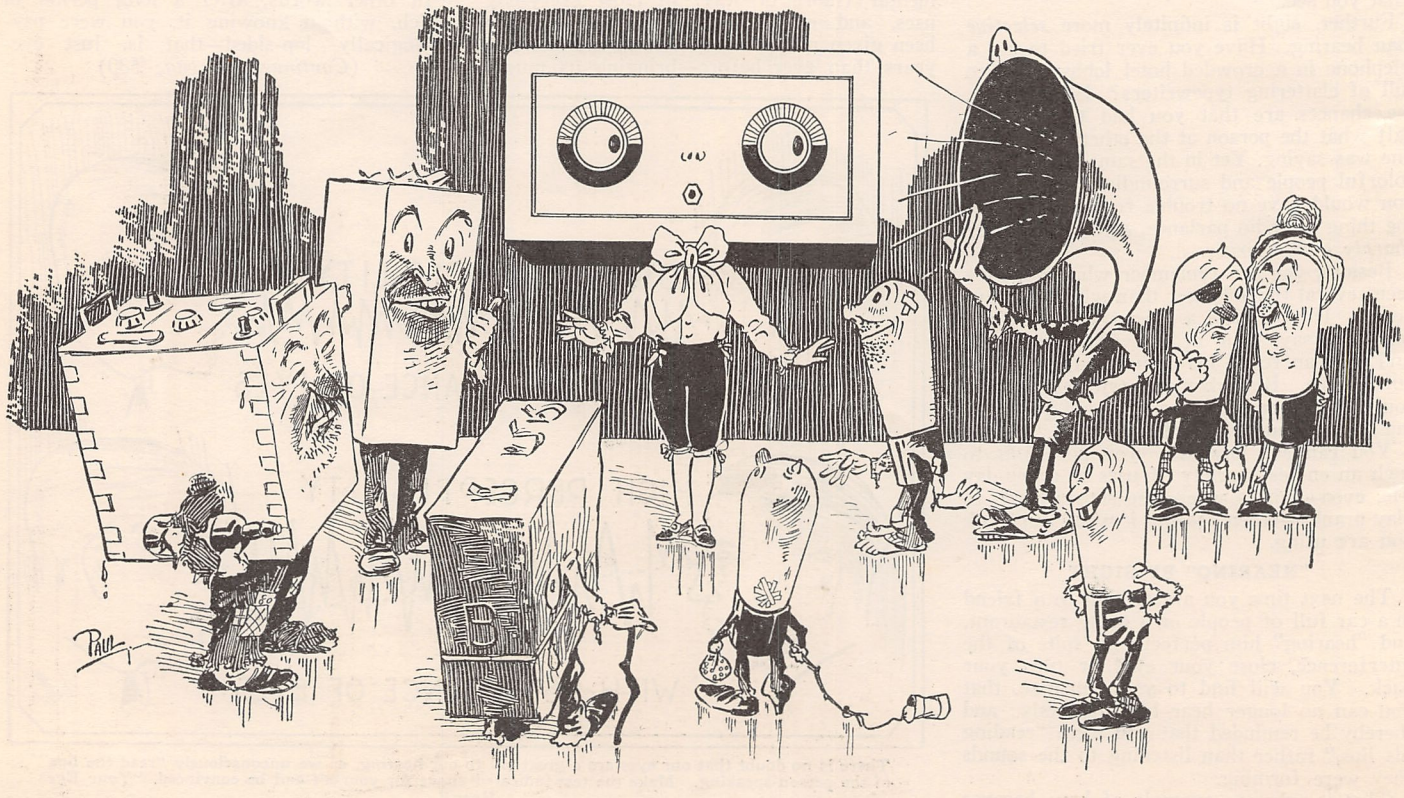
*Apex Electrical Mfg. Co.



How can a self-respecting radio receiver be expected to give honest reproduction when company like this is thrust upon it?

Confessions of An Installation Grafter

An Interview with a Man Who Has Installed Thousands of Radio Sets

THIS little collection of picaresque reminiscences contains not only human interest, but some facts which should be an eye-opener to the great army of radio set buyers who know nothing about the science or art of radio. It has been conservatively estimated that the public at large is taxed somewhat between $300,000 *and* $500,000 *a year by petty grafters, of the type whose methods are exposed in this article by our contributor—who, for obvious reasons, desires that his identity shall not be revealed.*

Do not let irresponsible individuals sell to you questionable or useless radio merchandise, by alluring promises or baseless representations.

—EDITOR.

EARLY in the day of the first commercial hook-ups, I was bit by the proverbial bug and invested in a radio set, advertised by a department store. Being thoroughly ignorant of the intricacies of the contraption, I had the set installed by a mechanic from the store. The price, completely installed was $49.50; but when the mechanic packed his bag to depart he was wealthier to the extent of $2.25, and the set had cost me $51.75.

He had, without the slightest difficulty, convinced me that I needed several insulators, a "C" battery, and a new connection for the "A" and "B" batteries. I gladly paid him the $2.25 and was rewarded by hearing the daily stock reports and weather forecast. Several years of tinkering with the set have since made me a master of the profound mysteries of its operation; and gradually there has dawned upon me a realization that I would have heard just as many stock reports and weather forecasts without the additional investment of $2.25.

Recently I found myself drafted into the army of the unemployed, at a time when a department store was seeking men to install a widely-advertised set which they were selling at a ridiculously low price. They sold more than 40,000 sets in three weeks; and I was one of the fortune-favored ones to be employed at a salary of $25 a week.

Recalling my own first experience with an unscrupulous mechanic, I determined to duplicate his nefarious scheme, and, incidentally, to swell my weekly income by $15 or more.

I reasoned that successful perpetration of the swindle depended upon my hypothesis, that any one who buys a ready-made set, including aerial, etc., completely installed at so much down and so much per week, is an uninitiated bug, thoroughly ignorant of the esoteric mysteries of radio theory.

And the plan worked! Each installation netted me an average of $2. If the purchaser paid cash for the set, I contrived to extract the maximum graft from his none-too-reluctant purse. Those who bought on the installment plan were assessed sums in proportion to the amount of their weekly payments.

My equipment consisted of a "C" battery, a tube, several highly polished battery connections (purchased at the 5- and 10-cent store) and an assortment of insulators which I procured at negligible expense, or even surreptitiously, from my employers.

Arriving at the home of a prospective victim I learned by two or three deft questions how much or how little he knew about the hook-up in question. Now, on these standard sets, the connection between the "A" and "B" batteries is a very ordinary-looking piece of wire. When the attention of the purchaser had been called to this fact, it took me about three minutes to point out the advantages (?), in clear reception and distance, which might be obtained by the use of a certain patented connection, one of which I carried in my bag.

"You will observe the genuine silk insulation, well varnished, and the non-leakable curved connections with patented clips. Now, I am selling these as a side line," I told him confidentially, "and if you care to have me put one on, it will cost you 75 cents."

He was sold. Of course, he was buying the set on the installment plan.

The next victim on the list had paid cash. His family was grouped around me waiting for the final twist of the knobs which would bring music into the household. Assuring myself that everything was in perfect condition I nonchalantly placed my thumb and fore-finger in such a position as to make a considerable shunt across the antenna and ground posts. A twist of the dial brought music from a station 300 miles distant—but, indeed, it sounded 300 miles away.

"Not very loud," remarked the disconcerted purchaser.

"Well," I explained, "you know the store can't guarantee tubes or any accessory of that sort. They are variable at best, and you will have to replace them occasionally. I happen to have a tube of my own in the bag. We'll try it."

Inserting the new tube, I released my strangle hold upon the receiver—and behold, Mary and Johnny were dancing a Charleston to the music of an orchestra 300 miles away.

"Quite an improvement," the victim assured me, proudly. (His set was working perfectly.) "Yes, indeed, leave it on. How much is it?"

"Two eighty-five," I responded promptly, dropping the "defective" tube in my bag. That old tube had a potential value of $2.85 to the next gullible customer.

One afternoon, in a cold-blooded mood, I deliberately cut a piece from one of our "standard" 50-foot lead-in wires. I showed the lady of the house the end of the wire dangling from the roof, two feet above the insulator.

"Well, well," she remarked laconically.

"You see, your house is unusually high," I told her without batting a lash. "However, I have in my bag a coil of the same wire, which you may have for 75 cents."

"By all means. Put it on."

I proceeded to attach the cut section to the other end. When the job was completed I called her attention to the neatness of the connection; but she was busy contrasting her own dangling wire with the trim row of insulators on the house next door. My eyes must have gleamed villainously.

"Madame, at this low price the store cannot be so meticulous in the finished detail of the outfit. However, I have a few insulators in my bag; and if you care to have me put them on, they cost 10 cents each."

I found room for five insulators.

One of my favorite tricks was to attach a combination voltmeter and ammeter to a "C" battery, push the *ammeter* button; and shake my head dolefully as the indicator pointed to "3."

"What's wrong?" the purchaser hastened to inquire.

"The 'C' battery seems to be low," I in-

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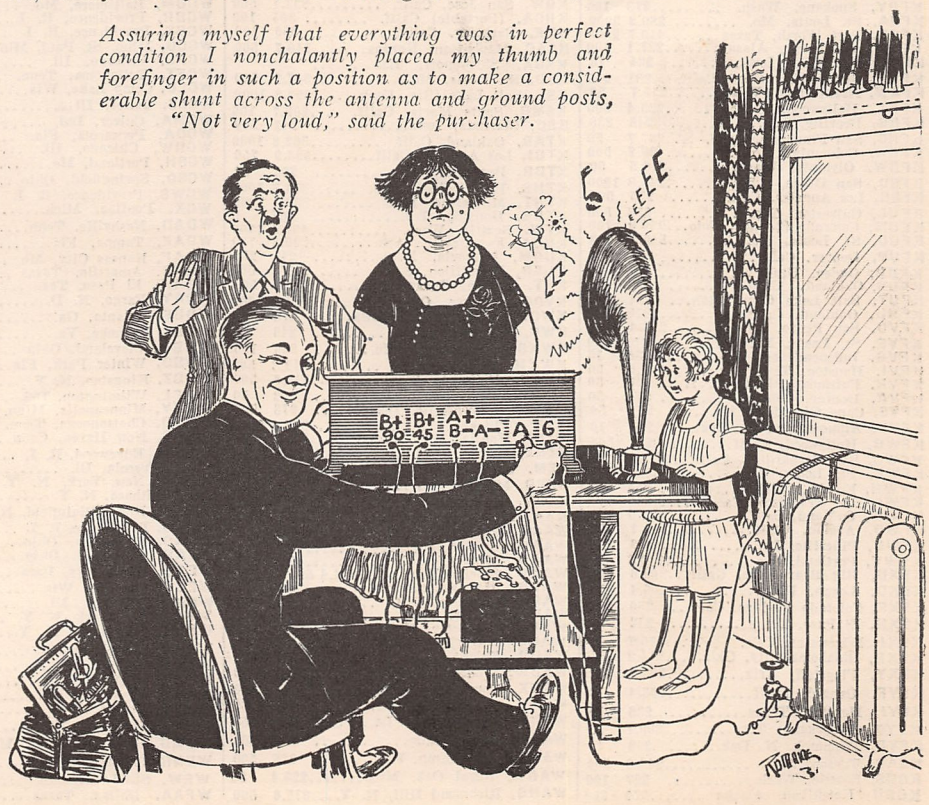
Assuring myself that everything was in perfect condition I nonchalantly placed my thumb and forefinger in such a position as to make a considerable shunt across the antenna and ground posts, "Not very loud," said the purchaser.



List of Broadcast Stations in the United States

Radio Call Letter	BROADCAST STA. Location	Wave (Meters)	Power (Watts)
KDKA,	East Pittsburgh, Pa.	309.1	Var.
KDLR,	Devils Lake, N. D.	231	5
KDYL,	Salt Lake City, Utah	246	50
KFAB,	Lincoln, Neb.	340.7	1000
KFAD,	Phoenix, Ariz.	273	100
KFAF,	San Jose, Calif.	217.3	50
KFAU,	Boise, Idaho	280.2	750
KFBB,	Havre, Mont.	275	50
KFBC,	San Diego, Calif.	380	50
KFBK,	Sacramento, Calif.	248	100
KFBL,	Everett, Wash.	224	100
KFBS,	Trinidad, Colo.	238	15
KFBU,	Laramie, Wyo.	375	500
KFCB,	Phoenix, Ariz.	238	100
KFDD,	Boise, Idaho	275.1	50
KFDM,	Beaumont, Tex.	315.6	500
KFDX,	Shreveport, La.	250	100
KFDY,	Brookings, S. Dak.	305.9	100
KFDZ,	Minneapolis, Minn.	231	10
KFEC,	Portland, Ore.	248	50
KFEL,	Denver, Colo.	254	250
KFEQ,	Oak, Nebr.	268	500
KFEY,	Kellogg, Idaho	233	10
KFFP,	Moberly, Mo.	242	50
KFGQ,	Boone, Iowa	226	10
KFH,	Wichita, Kans.	268	500
KFHA,	Gunnison, Colo.	252	50
KFHL,	Oskaloosa, Iowa	240	10
KFI,	Los Angeles, Calif.	467	5000
KFIF,	Portland, Ore.	248	100
KFIO,	Spokane, Washington	273	500
KFIQ,	Yakima, Wash.	256	500
KFIU,	Juneau, Alaska	226	10
KFIZ,	Fond du Lac, Wis.	273	100
KFJB,	Marshalltown, Iowa	248	10
KFJC,	Junction City, Kansas	218.8	10
KFJF,	Oklahoma City, Okla.	261	500
KFJI,	Astoria, Ore.	246	10
KFJM,	Grand Forks, N. Dak.	278	100
KFJR,	Portland, Ore.	263	120
KFJY,	Fort Dodge, Iowa	246	50
KFJZ,	Fort Worth, Tex.	254	50
KFKA,	Greeley, Colo.	273	50
KFKU,	Lawrence, Kans.	275	500
KFKX,	Hastings, Nebr.	288.3	5000
KFKZ,	Kirksville, Mo.	225.4	50
KFLR,	Albuquerque, N. Mex.	254	100
KFLU,	San Benito, Tex.	236	20
KFLV,	Rockford, Ill.	229	100
KFLX,	Galveston, Tex.	240	250
KFLZ,	Anita, Iowa	273	100
KFMR,	Sioux City, Iowa	261	100
KFMX,	Northfield, Minn.	336.9	500
KFNF,	Shenandoah, Iowa	461.3	2500
KFOA,	Seattle, Wash.	454.3	1000
KFOB,	Burlingame, Calif.	226	50
KFON,	Long Beach, Calif.	233	500
KFOR,	David City, Nebr.	226	100
KFOT,	Wichita, Kans.	231	50
KFOX,	Omaha, Nebr.	248	100
KFOY,	St. Paul, Minn.	252	50
KFPL,	Dublin, Texas	252	20
KFPM,	Greenville, Texas	242	10
KFPR,	Los Angeles, Calif.	230.6	500
KFPW,	Carterville, Mo.	258	20
KFPY,	Spokane, Wash.	273	100
KFQA,	St. Louis, Mo.	280.2	5000
KFQB,	Fort Worth, Texas	410.7	2500
KFQD,	Anchorage, Alaska	227.1	100
KFQP,	Iowa City, Iowa	224	10
KFQU,	Alma (Holy City) Calif.	231	250
KFQW,	North Bend, Wash.	215.7	50
KFQZ,	Hollywood, Calif.	225.4	500
KFRB,	Beeville, Tex.	248	250
KFRC,	San Francisco, Calif.	267.7	50
KFRU,	Columbia, Mo.	499.7	500
KFRW,	Olympia, Wash.	218.8	50
KFSD,	San Diego, Calif.	245.8	1000
KFSG,	Los Angeles, Calif.	275	500
KFUL,	Galveston, Tex.	258	500
KFUM,	Colorado Springs, Colo.	239.9	100
KFUO,	St. Louis, Mo.	545.1	500
KFUP,	Denver, Colo.	234	50
KFUR,	Ogden, Utah	224	50
KFUS,	Oakland, Calif.	256	50
KFUT,	Salt Lake City, Utah	261	100
KFUU,	Oakland, Calif.	220	100
KFVD,	San Pedro, Calif.	205.4	50
KFVE,	St. Louis, Mo.	240	5000
KFVG,	Independence, Kas.	236	15
KFVI,	Houston, Texas	239.9	50
KFVN,	Fairmont, Minn.	227	50
KFVR,	Denver, Colo.	244	50
KFVS,	Cape Girardeau, Mo.	224	50
KFVY,	Albuquerque, N. Mex.	250	10
KFWB,	Hollywood, Calif.	252	500
KFWC,	San Bernardino, Calif.	211.1	200
KFWF,	St. Louis, Mo.	214.2	250
KFWH,	Eureka, Calif.	254	100
KFWI,	San Francisco, Calif.	250	500
KFWM,	Oakland, Calif.	325.9	500
KFWO,	Avalon, Calif.	211.1	250
KFWU,	Placerville, La.	238	100
KFWV,	Portland, Ore.	212.6	50
KFXB,	Big Bear Lake, Calif.	202.6	500
KFXD,	Logan, Utah	205.4	10
KFXF,	Colorado Springs, Colo.	250	500
KFXH,	El Paso, Texas	242	50
KFXJ,	Edgewater, Colo.	215.7	15
KFXR,	Oklahoma City, Okla.	214.2	15
KFXY,	Flagstaff, Ariz.	205.4	50
KFYF,	Oxnard, Calif.	205.4	10
KFYJ,	Houston, Texas	238	10
KFYO,	Texarkana, Tex.	209.7	10
KFYR,	Bismarck, N. Dak.	248	10
KGAR,	Tucson, Ariz.	243.8	500
KGBS,	Seattle, Wash.	227	100
KGBU,	Ketchikan Alaska	229	500
KGBW,	Joplin, Mo.	282.8	250
KGBX,	St. Joseph, Mo.	347.8	50
KGBY,	Shelby, Neb.	202.6	50
KGBZ,	York, Neb.	333.1	100
KGCA,	Decorah, Ia.	280.2	20
KGCB,	Oklahoma City, Okla.	331	50
KGCG,	Newark, Ark.	234.2	100
KGCH,	Wayne, Neb.	434	500
KGCI,	San Antonio, Tex.	239.9	15
KGCL,	Seattle, Wash.	230.6	10
KGCM,	San Antonio, Tex.	263	10
KGCN,	Concordia, Kas.	210	50
KGO,	Oakland, Calif.	361.2	5000
KGTT,	San Francisco, Calif.	206.8	50
KGU,	Honolulu, Hawaii	270	500
KGW,	Portland, Ore.	491.5	1000
KGY,	Lacey, Wash.	277.6	50
KHJ,	Los Angeles, Calif.	405.2	500
KHQ,	Spokane, Wash.	394.5	1000
KHX,	Los Angeles, Calif.	119.9	500
KICK,	Anita, Ia.	273	100
KJBS,	San Francisco, Calif.	220	5
KJR,	Seattle, Wash.	384.4	1000
KLDS,	Independence, Mo.	440.9	1000
KLS,	Oakland, Calif.	250	250
KLX,	Oakland, Calif.	508.2	500
KLZ,	Denver, Colo.	266	250
KMA,	Shenandoah, Iowa	461	500
KMJ,	Fresno, Calif.	234	50
KMJP,	Kansas City, Mo.	440.9	1000
KMMJ,	Clay Center, Neb.	228.9	1000
KMO,	Tacoma, Wash.	250	100
KMOX,	Kirkwood, (St. Lo)., Mo.	280.2	5000
KMTR,	Hollywood, Calif.	238	500
KNRC,	Los Angeles, Calif.	208.2	500
KNX,	Los Angeles, Calif.	336.9	500
KOA,	Denver, Colo.	322.4	5000
KOAC,	Corvallis, Ore.	280.2	500
KOB,	State College, N. M.	348.6	5000
KOCH,	Omaha, Neb.	258	500
KOCW,	Chickasha, Okla.	252	200
KOIL,	Council Bluffs, Iowa	305.9	500
KOIN,	Portland, Ore	319	1000
KOMO,	Seattle, Wash.	305.9	1000
KOWW,	Walla Walla, Wash.	285.5	500
KPO,	San Francisco, Calif.	428.3	1000
KPPC,	Pasadena, Calif.	229	50
KPRC,	Houston, Texas	296.9	500
KPSN,	Pasadena, Calif.	315.6	1000
KQV,	Pittsburgh, Pa.	275	500
KQW,	San Jose, Calif.	333.1	500
KRCA,	(Portable) Calif.	305	100
KRE,	Berkeley, Calif.	256	100
KSAC,	Manhattan, Kansas	340.7	500
KSBA,	Shreveport, La.		
KSD,	St. Louis, Mo.	545.1	500
KSL,	Salt Lake City, Utah	299.8	1000
KSMR,	Santa Maria, Calif.	209.7	100
KSO,	Clarinda, Iowa	242	500
KTAB,	Oakland, Calif.	302.8	1000
KTBI,	Los Angeles, Calif.	293.9	750
KTBR,	Portland, Ore	263	50
KTHS,	Hot Springs, Ark.	374.8	1000
KTNT,	Muscatine, Iowa	333.1	1000
KTUE,	Houston, Tex.	265	5
KTW,	Seattle, Wash.	454.3	1500
KUOA,	Fayetteville, Ark.	299.8	750
KUOM,	Missoula, Mont.	244	250
KUSD,	Vermillion, S. D.	278	500
KUT,	Austin, Texas	231	500
KVOO,	Bristow, Okla.	374.8	1000
KWCR,	Cedar Rapids, Iowa	278	500
KWG,	Stockton, Calif.	248	50
KWKC,	Kansas City, Mo.	256	100
KWKH,	Shreveport, La.	312.3	500
KWSC,	Pullman, Wash.	348.6	500
KWUC,	Le Mars, Iowa	252	50
KWWG,	Brownsville, Texas	278	500
KYW,	Chicago, Ill.	535.4	2000
KZIB,	Manila, P. I.	249.9	20
KZKZ,	Manila, P. I.	270	100
KZM,	Oakland, Calif.	240	100
KZRQ,	Manila, P. I.	222	500
KZUY,	Baguio, P. I.	360	500
NAA,	Arlington, Va.	434.5	1000
WAAD,	Cincinnati, Ohio	258	25
WAAF,	Chicago, Ill.	278	500
WAAM,	Newark, N. J.	263	500
WAAW,	Omaha, Neb.	384.4 & 278	500
WABB,	Harrisburg, Pa.	204	10
WABC,	Asheville, N. C.	254	100
WABI,	Bangor, Me.	240	100
WARQ,	Rochester, N. Y.	258	100
WABQ,	Haverford, Pa.	261	1000
WABR,	Toledo, Ohio	263	50
WABW,	Wooster, Ohio	206.8	50
WABX,	Mount Clemens, Mich.	246	500
WARY,	Philadelphia, Pa.	242	50
WABZ,	New Orleans, La.	275	50
WADC,	Akron, Ohio	258	500
WAFD,	Port Huron, Mich.	275	500
WAGM,	Royal Oak, Mich.	225.4	50
WAHG,	Richmond Hill, N. Y.	315.6	500
WAIT,	Taunton, Mass.	229	10
WAIU,	Columbus, Ohio	293.9	1000
WAMD,	Minneapolis, Minn.	244	5000
WAPI,	Auburn, Ala.	248	1000
WARC,	Medford Hillside, Mass.	261	100
WATT,	Boston, Mass.	243.8	100
WBAA,	West Lafayette, Ind.	273	250
WBAK,	Harrisburg, Pa.	275	500
WBAL,	Glen Morris, Md.	246	5000
WBAO,	Decatur, Ill.	270	100
WBAP,	Fort Worth, Texas	475.9	1500
WBAW,	Nashville, Tenn.	236.1	100
WBAX,	Wilkes-Barre, Pa.	256	100
WBBC,	Brooklyn, N. Y.	249.9	100
WBBL,	Richmond, Va.	228.9	100
WBBM,	Chicago, Ill.	226	10000
WBBP,	Petoskey, Mich.	238	200
WBBR,	Rossville, N. Y.	416.4	500
WBBS,	New Orleans, La.	252	50
WBBW,	Norfolk, Va.	222	50
WBBY,	Charleston, S. C.	268	10
WBBZ,	Chicago, Ill.	215.7	50
WBCN,	Chicago, Ill.	266	500
WBDC,	Grand Rapids, Mich.	256	500
WBES,	Takoma Park, Md.	222	100
WBNY,	New York, N. Y.	322.4	1000
WBOQ,	Richmond Hill, N. Y.	236	100
WBRC,	Birmingham, Ala.	218	50
WBRE,	Wilkes-Barre, Pa.	231	100
WBRS,	Brooklyn, N. Y.	394	
WBT,	Charlotte, N. C.	275	250
WBZ,	Springfield, Mass.	331.1	5000
WBZA,	Boston, Mass.	331.1	500
WCAC,	Storrs, Conn.	275	500
WCAD,	Canton, N. Y.	263	250
WCAE,	Pittsburgh, Pa.	461.3	500
WCAJ,	University Place, Neb.	254	500
WCAL,	Northfield, Minn.	336.9	500
WCAM,	Camden, N. J.	236	250
WCAO,	Baltimore, Md.	275	100
WCAR,	San Antonio, Texas	263	2000
WCAT,	Rapid City, S. D.	240	50
WCAU,	Philadelphia, Pa.	277.6	500
WCAX,	Burlington, Vt.	250	100
WCBA,	Allentown, Pa.	254	125
WCBD,	Zion, Ill.	344.6	5000
WCBE,	New Orleans, La.	263	15
WCBH,	Oxford, Miss.	242	50
WCBM,	Baltimore, Md.	229	100
WCBR,	Providence, R. I.	231	100
WCBS,	Providence, R. I.	242.5	250
WCCO,	Minn.-St. Paul, Minn.	416.4	5000
WCFL,	Chicago, Ill.	491.5	500
WCFT,	Tullahoma, Tenn.	252	
WCLO,	Camp Lake, Wis.	231	50
WCLS,	Joliet, Ill.	214.2	150
WCMA,	Culver, Ind.	258.5	100
WCOA,	Pensacola, Fla.	222.1	500
WCRW,	Chicago, Ill.	416.4	
WCSH,	Portland, Me.	256	500
WCSO,	Springfield, Ohio	248	100
WCWS,	Providence, R. I.	282.8	100
WCX,	Pontiac, Mich.	516.9	5000
WDAD,	Nashville, Tenn.	226	150
WDAE,	Tampa, Fla.	273	250
WDAF,	Kansas City, Mo.	365.6	1000
WDAG,	Amarillo, Texas	263	100
WDAH,	El Paso, Tex.	267.7	50
WDAY,	Fargo, N. D.	261	50
WDBE,	Atlanta, Ga.	270	100
WDBJ,	Roanoke, Va.	229	50
WDBK,	Cleveland, Ohio	227	500
WDBO,	Winter Park, Fla.	240	500
WDBZ,	Kingston, N. Y.	233	10
WDEL,	Wilmington, Del.	266	100
WDGY,	Minneapolis, Minn.	263	500
WDOD,	Chattanooga, Tenn.	256	500
WDRC,	New Haven, Conn.	268	100
WDWF,	Edgewood, R. I.	440.9	500
WDZ,	Tuscola, Ill.	278	100
WEAF,	New York, N. Y.	491.5	5000
WEAI,	Ithaca, N. Y.	254	500
WEAM,	North Plainfield, N. J.	261	250
WEAN,	Providence, R. I.	367	500
WEAO,	Columbus, Ohio	293.9	750
WEAR,	Cleveland, Ohio	389.4	750
WEAU,	Sioux City, Iowa	275	100
WEBC,	Superior, Wis.	242	100
WEBH,	Chicago, Ill.	370.2	2000
WEBJ,	New York, N. Y.	272.6	500
WEBL,	New York, N. Y.	226	100
WEBQ,	Harrisburg, Ill.	226	100
WERR,	Buffalo, N. Y.	244	100
WEBW,	Beloit, Wis.	268	500
WEBZ,	Savannah, Ga.	263	50
WEEI,	Boston, Mass.	348.6	500
WEHS,	Evanston, Ill.	202.6	10
WEMC,	Berrien Springs, Mich.	285.5	500
WENR,	Chicago, Ill.	266	1000
WEW,	St. Louis, Mo.	360	1000
WFAA,	Dallas, Texas	475.9	500
WFAM,	St. Cloud, Minn.	273	10
WFAV,	Lincoln, Nebr.	275	500
WFBC,	Knoxville, Tenn.	250	50
WFBE,	Seymour, Ind.	226	10
WFBG,	Altoona, Pa.	278	100
WFBH,	New York, N. Y.	273	500
WFBJ,	Collegeville, Minn.	236	100
WFBL,	Syracuse, N. Y.	252	100
WFBM,	Indianapolis, Indiana	268	250
WFBR,	Baltimore, Md.	254	100
WFBZ,	Galesburg, Ill.	254	20
WFCI,	Pawtucket, R. I.	229	
WFDF,	Flint, Mich.	234	100
WFI,	Philadelphia, Pa.	394.5	500
WFKB,	Chicago, Ill.	217.3	500
WFLA,	Clearwater, Fla.	265.3	500
WFRL,	Brooklyn, N. Y.	205.4	100
WGAL,	Lancaster, Pa.	248	10
WGBB,	Freeport, N. Y.	244	100
WGBC,	Memphis, Tenn.	278	10
WGBF,	Evansville, Ind.	236	500
WGBI,	Scranton, Pa.	240	100
WGBR,	Marshfield, Wis.	229	10
WGBS,	New York, N. Y.	315.6	500
WGBU,	Fulford, Fla.	278	500
WGBX,	Orono, Me.	234.2	500
WGCM,	San Antonio, Tex.	263	
WGCP,	Newark, N. J.	252	500
WGES,	Chicago, Ill.	250	500
WGHP,	Detroit, Mich.	270	1500
WGMU,	Richmond Hill, N. Y.	236	100
WGM,	Jeannette, Pa.	372	150
WGN,	Elgin, Ill.	302.8	1000
WGR,	Buffalo, N. Y.	319	750
WGST,	Atlanta, Ga.	270	500
WGY,	Schenectady, N. Y.	379.5	50000
WHA,	Madison, Wis.	535.4	750
WHAD,	Milwaukee, Wis.	275	500
WHAM,	Rochester, N. Y.	278	100
WHAP,	New York, N. Y.	431	500
WHAR,	Atlantic City, N. J.	275	500
WHAS,	Louisville, Ky.	399.8	500
WHAZ,	Troy, N. Y.	379.5	500
WHB,	Kansas City, Mo.	365.6	500
WHBA,	Oil City, Pa.	250	10
WHBC,	Canton, Ohio	254	10
WHBD,	Bellefontaine, Ohio	222	20
WHBF,	Rock Island, Ill.	222	100
WHBG,	Harrisburg, Pa.	231	20
WHBJ,	Fort Wayne, Ind.	234.2	250
WHBL,	Chicago, Ill.	215.7	50
WHBM,	Chicago, Ill.	215.7	20
WHBN,	St. Petersburg, Fla.	238	10
WHBP,	Johnstown, Pa.	256	100
WHBQ,	Memphis, Tenn.	233	50
WHBR,	Cincinnati, O.	215.7	300
WHBU,	Anderson, Ind.	218.8	10
WHBW,	Philadelphia, Pa.	215.7	100
WHBY,	West De Pere, Wis.	250	50
WHDI,	Minneapolis, Minn.	278	500
WHEC,	Rochester, N. Y.	258	100
WHFC,	Chicago, Ill.	258.5	100
WHK,	Cleveland, Ohio	272.6	1000
WHN,	New York, N. Y.	361.2	500
WHO,	Des Moines, Iowa	526	5000
WHT,	Deerfield, Ill.	399.8	3500
WIAD,	Philadelphia, Pa.	250	100
WIAS,	Burlington, Iowa	254	100
WIBA,	Madison, Wis.	236	100
WIBG,	Elkins Park, Pa.	222	50
WIBH,	New Bedford, Mass.	209.7	30
WIBI,	Flushing, N. Y.	218.8	50
WIBJ,	Chicago, Ill.	215.7	50
WIBM,	Chicago, Ill.	215.7	10
WIBO,	Chicago, Ill.	226	1000
WIBR,	Steubenville, Ohio	246	50
WIBS,	Elizabeth, N. J.	202.6	10
WIBU,	Poynette, Wis.	222	20
WIBW,	Logansport, Ind.	220	100
WIBX,	Utica, N. Y.	234.2	150
WIBZ,	Montgomery, Ala.	230.6	10
WIL,	St. Louis, Mo.	273	250
WIOD,	Miami Beach, Fla.	247.8	1000
WIP,	Philadelphia, Pa.	508.2	500
WJAD,	Waco, Texas	352.7	500
WJAF,	Ferndale, Mich.	400	
WJAG,	Norfolk, Nebr.	270	200
WJAK,	Kokomo, Ind.	254	50
WJAM,	Cedar Rapids, Iowa	268	100
WJAR,	Providence, R. I.	305.9	500
WJAS,	Pittsburgh, Pa.	275.1	500
WJAX,	Jacksonville, Fla.	336.9	1000
WJAZ,	Mount Prospect, Ill.	329.8	5000
WJBA,	Joliet, Ill.	206.8	50
WJBB,	St. Petersburg, Fla.	254	250
WJBC,	La Salle, Ill.	234	100
WJBI,	Red Bank, N. J.	218.8	250
WJBK,	Ypsilanti, Mich.	233	10
WJBL,	Decatur, Ill.	270	500
WJBO,	New Orleans, La.	268	100
WJBR,	Omro, Wis.	227.1	50
WJBT,	Chicago, Ill.	238	500
WJBU,	Lewisburg, Pa.	211.1	100
WJBV,	Woodhaven, N. Y.	469.9	500
WJBW,	New Orleans, La.	340.7	
WJBX,	Osterville, Mass.	280	100
WJBY,	Gadsden, Ala.	270.1	15
WJJD,	Mooseheart, Ill.	370.2	1000
WJR,	Pontiac, Mich.	516.9	5000
WJY,	New York, N. Y.	405.2	1000
WJZ,	Bound Brook, N. J.	454.3	50,000
WKAF,	Milwaukee, Wis.	261	500
WKAQ,	San Juan, P. R.	340.7	500
WKAR,	East Lansing, Mich.	285.5	1000
WKAV,	Laconia, N. H.	224	50
WKBA,	Chicago, Ill.	209.7	200
WKBB,	Joliet, Ill.	282.8	100

At the closing date of this magazine, the list of broadcast stations is subject to daily alterations, as regards wavelengths, power, etc. We especially request stations making changes at this time to send a notification to RADIO NEWS in order that broadcast listeners may be advised as soon as possible of the new conditions which they may expect in tuning in the stations.

(Continued on page 503)

Cheer for the Shut-Ins

Will You Send a Radio Message of Cheer to Brighten the Life of a Shut-In?

FEW of us, fortunately, have experienced the true "seamy side" of life, and can appreciate from our own misfortunes the extent of human suffering among those who face existence at its worst—destitute of friends, of money, of health itself, the last prop of self-reliance. Those who have themselves suffered, or tasted deeply of the bitterness of affliction, are quickest to show compassion for the unfortunate; for "sympathy" is feeling the emotions of others, most fully realized from the deepest memories of our own experiences.

We are, however, all of the same great family and, even though our own history may not impress us with the kindred of common suffering, we must be affected deeply by the plight of those on whom misfortune has rained her deepest blows, when they are presented to us as fellow human beings. It is then that the spirit of altruism, never absent from a mortal bosom, commandingly bids us to do our utmost to relieve their pain.

The kindest gift is that which bears with it something of the giver, as that is timeliest which meets the most urgent need of the recipient. To our friends in sickness or in trouble, the kind word and the handclasp are not the least welcome assistance. These are most eloquent of companionship; and the most dreadful thing in the world is not poverty nor even ill-health, but to be cut off from the companionship and sympathy of one's kind.

WHERE SOLITUDE IS SUFFERING

We think also of those of whom we know only by hearing of their misfortunes; we help to maintain religious, benevolent, fraternal organizations as our agencies to find and to relieve them. But seldom, indeed, does our memory dwell on those unfortunates, the "shut-ins," who are hidden by their forced seclusion from our pitying eyes. Thousands of them there are, whose narrow rooms are prisons, whose beds of pain are often living graves, whose keenest sufferings are not of the body, but of the mind. Even the resources of wealth, of power, of intellectual eminence, have not been sufficient to make such existence bearable for their possessors; judge, then, the misery of those who are poor, friendless, without occupation for their thoughts other than a bitter, brain-racking contemplation of their burdens and unhappiness!

What a ray of sunshine to the shut-in is a visitor, a bit of companionship, a flower, a few pictures, the sound of music, a book to read—anything to dispel the weight of loneliness and give a few moments' opportunity for forgetfulness of dreary surroundings. But many such unfortunates have few friends, they must be left alone for long hours by the breadwinners, they have not eyesight or strength to read. There is one companion, and one alone, who could cheer their lonely hours—RADIO!

Imagine what it would mean to the prisoner of illness and poverty. Human speech, human companionship, unfailing delight, the pleasures of melody to make many a lonely hour one of freedom! Like a magic carpet, the radio bids its possessor soar beyond his walls into exploration of new lands and romantic adventures. What greater gift could there be to one whose worst affliction is sickness of heart and mind?

RADIO NEWS, in conjunction with the Charity Organization Society of the City of New York, and a number of other charitable organizations throughout the country, is making a special drive to bring cheer to the "shut-ins" and those unfortunates who can not leave their beds, and who must eke out an existence in a living grave.

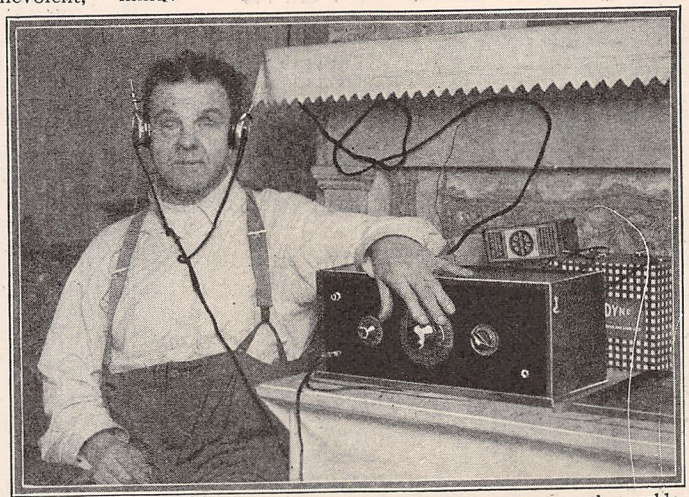
A number of authentic cases will be published every month, and the readers of RADIO NEWS, as well as the radio industry at large, are invited to contribute toward supplying these worthy sufferers with the comforts of radio.

RADIO NEWS will be the clearing house for all cases, and will see that all radio apparatus given by its readers reaches those for whom it is sent.

If you know of any worthy shut-in, RADIO NEWS will have the case investigated, and will see to it that such invalids are supplied with radio sets and accessories, wherever possible.

All cases published have been furnished to RADIO NEWS by the various charitable organizations, and have been found to be bona fide in every way.

RADIO NEWS pledges itself also to publish the names of all donors and the list of equipment received for the various cases.



This man is totally blind. But in early years his eyes were open to the world; he keeps the memory of it with him. Radio has helped him to fill the darkness about him with comforters. This set is used seven hours a day.
Photo by Radio News.

Doctors have borne witness to the almost immediate recovery of the convalescent who finds in radio a new incentive to interest in life. It is becoming one of the most efficient remedies in the materia medica for those who are curable. Institutions will soon make its use universal. But what of the poor stay-at-homes, some curable, and some to end their days where they now lie?

YOU CAN HELP

There are many of the readers of RADIO NEWS who will be only too glad to have the opportunity of bringing a little pleasure into the life of a shut-in, to whom at present even the bare necessities of existence are scarcely available. There are many among you, for instance, who have radio equipment in perfect order, which you have superseded by other apparatus of later design or more attractive appearance. It might well be put to work for the benefit of those who will receive it with inexpressible gratitude.

Perhaps you do not call to mind, within the circle of your knowledge, one who needs it. If so, we can tell you of those who do, and undertake to see that your gift goes to the right place. Below are a few worthy opportunities, briefly described so that you may see what a kindness you can do; in later articles we will tell of other cases that are brought to our attention. You need not fear that the response, generous as we are sure it will be, will exceed the opportunity to be of service.

If you have a radio receiver, even the simplest, which you do not expect to use again, or accessories, such as tubes, phones, batteries, loud-speakers, etc., *in serviceable condition,* send them to the Editorial Office of RADIO NEWS at 53 Park Place, New York City: indicating, if you so prefer, the person to whom you desire that it should go; and RADIO NEWS will see that your gift reaches its destination and is acknowledged. Should the one you select be already helped by another friend, your gift will go to a similar and equally worthy recipient.

Here are a few simple stories about the lives of poor people to whom radio would indeed be a boon; charitable persons have assisted them to keep soul and body together; but we feel sure that you will be anxious to put a little additional sunshine into their homes. Read these little tales, and they will, we are sure, meet with a prompt response.

Case No. 1

Acute asthma has made an invalid of Daniel F., and his wife has had to go out to work to support their three small children. He still feels that he ought to work; but he has been forced to give up a position which he has held for fourteen years, and the time hangs heavy on his hands. The doctor says he must keep his spirits up if he is to get better physically, but that is not easy with nothing to occupy him all day long.

A radio set would be a boon to him and might help materially in improving his health by taking his mind off his worries.

Case No. 2

Andy is thirteen, lively, mischievous, irrepressible, and longing for a radio! His tired, half-sick mother is at her wit's end to know what to do with him.

Andy's father has deserted her, leaving her with Andy and three younger children to bring up, so there is no money for a luxury like a radio in their tenement home. The mother's earnings as a cleaning woman do not cover even their bare necessities. They must continue from day to day, as best they can, and be thankful for the mere fact of their existence.

Mrs. A. has begun to think that she will have to break up her home and put the children in institutions. The *Charity Organization Society* hopes to prevent this and

(*Continued on page* 589)

The B.B.C. in the Melting Pot

A Review of the Broadcasting Situation in Great Britain

By A. DINSDALE

READERS have, no doubt, seen references in the general press to the proposed changes in the administration of British broadcasting; but even in England, the position is still wrapped in the obscurity of red tape and officialism. The general public and the radio industry are still impatiently awaiting the decision of the administration as to the exact constitution of the new controlling authority. Under these circumstances, therefore, it may be of interest to readers of RADIO NEWS to review the situation, especially on account of the present broadcasting situation in the United States and the possibilities of future legislation on the subject.

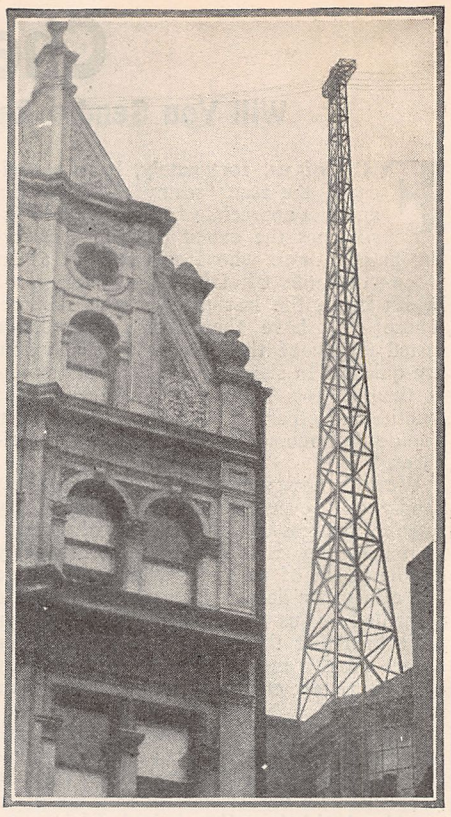
Broadcasting originally started in England in much the same way that it did in the United States; that is to say, a few manufacturers of radio apparatus erected stations under experimental licenses and broadcast limited, but regular programs. This state of affairs was not permitted to last long, however, for in Great Britain the postmaster general is the holder of a complete monopoly of all electrical communications. Within a very short space of time he assumed control of the new method of communication; and on January 18, 1923, he granted to the newly-formed British Broadcasting Company a license for broadcasting till December 31, 1924.

This license called for the establishment by this company, commonly called in short the "B. B. C.", of eight transmitting stations; but, in pursuance of the company's democratic policy, when its license was further extended to December 31, 1926, eleven relay stations, a new main station, and the high-power station at Daventry were added.

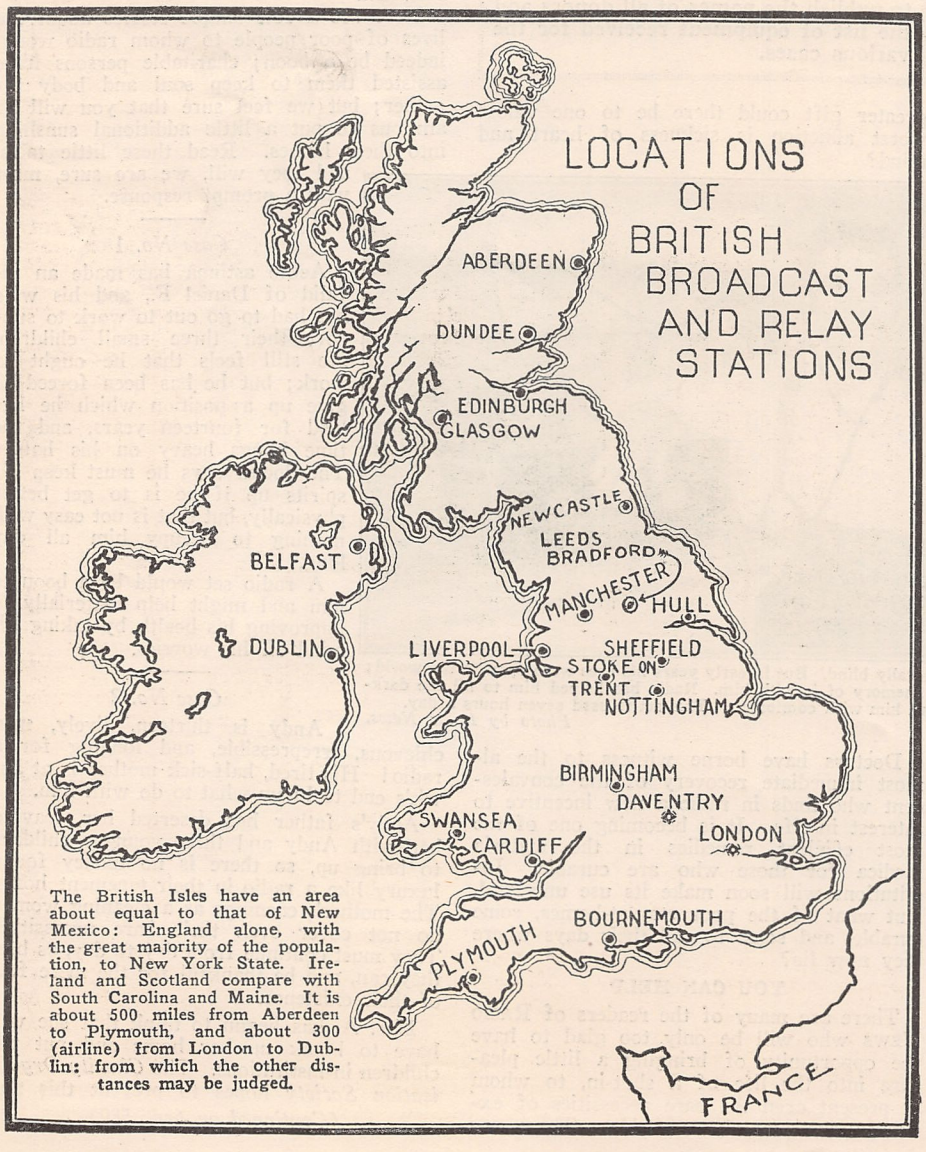
B. B. C. FINANCE

The initial capital required to start the Company, according to a statement recently issued, was about £60,000 ($300,000). This amount was expended in the purchase of equipment, etc., and was subscribed by radio manufacturers. At the present time 1,715 manufacturers are members of the company; but the controlling interest is held by six of the leading concerns, and the present total subscribed capital is approximately £70,000 ($350,000). In accordance with the terms of the company's license, the dividend is limited to 7½%; all revenue in excess of that necessary to pay this dividend is to be devoted to the improvement of stations, programs, etc.

One of the recommendations laid down by a committee, which investigated the problem of broadcasting in 1923, was that no part of the cost of broadcasting should fall on the taxpayer; but that the government should not endeavor to make a profit on the administration of the service.



One of the antenna masts of London's great broadcast station, 2LO, which is located on Selfridge's department store.



The British Isles have an area about equal to that of New Mexico: England alone, with the great majority of the population, to New York State. Ireland and Scotland compare with South Carolina and Maine. It is about 500 miles from Aberdeen to Plymouth, and about 300 (airline) from London to Dublin: from which the other distances may be judged.

Under the original license 50% of the license income was payable to the B. B. C., 50% being retained by the post office to cover expenses in connection with the issuance of broadcast receiving licenses. Subsequently it was determined by the above-mentioned investigating committee that 75% of the revenue could be given to the B. B. C.; and it was expected that, as the number of licenses increases, a still larger percentage would be handed over. To cover this latter contingency, a supplementary agreement stated amongst other things that up to and including December 31, 1926, the postmaster general should pay to the B. B. C. "such proportion as the postmaster general in consultation with the B. B. C. should consider reasonably adequate to enable the company to provide a broadcasting service to his reasonable satisfaction."

Acting under this clause the postmaster general considered it advisable, in view of the figures then before him, of the absence of public representation on the board of the company, and of the broadcasting inquiry about to begin, to limit the company's income to £500,000 ($2,500,000) for the year ending March 31, 1926. The consequent withholding of large amounts of money has hindered the putting into effect of many improvements in the service, which the company had intended to introduce. The B. B. C.'s attitude on the subject is that it has all along agreed that the post office should be fully reimbursed out of the license fees for expenses in connection with their collection; but that after these expenses have been paid, the entire remainder of the license money should go to the B. B. C. for the purpose of improving and extending the service.

LICENSE FIGURES AND POPULATION

Some idea of the large amount of money involved may be gathered from the following figures. The annual broadcast-receiving li-

cense fee is ten shillings ($2.50); and, owing to the character of the service, the number of licenses issued has steadily increased at a very rapid rate, as shown by the table given below.

Date	Total Licenses
Sept. 30, 1923	158,871
March 31, 1924	720,895
March 31, 1925	1,348,840
March 31, 1926	1,964,912

The total number of licenses in force at the end of May, 1926, was 2,049,549. This means that the revenue from licenses during the past twelve months has been in the neighborhood of £1,025,000 ($5,105,000); and as the income of the B. B. C. has been arbitrarily limited to £500,000 it will be seen that the government, as represented by the post office, is benefiting to the extent of over half a million pounds ($2,500,000) in spite of the principle laid down that the government should not profit by broadcasting.

The B. B. C. now operates a total of 21 stations, which serve an estimated population of 25 millions in the rural and urban districts alone. This means that in these districts there is a receiving license for every third or fourth house. The total staff of the company numbers 725, including 250 engineers.

FUTURE DEVELOPMENTS

In Europe the tendency has grown towards fewer and higher-powered stations; and for some months past the B. B. C. has been planning to replace the present system of main and low-powered relay stations by a chain of high-power stations, judiciously scattered over the country in such a manner that the popular demand for alternative programs may be met.

By far the greater number of British listeners still use only crystal receivers, which ties them down to the local station only, without an alternative if the local program does not interest them. This persistent adhesion to crystal receivers is due to several causes. In the first place, component parts for tube receivers and manufactured receivers are more expensive in England than they are in the United States; also there are heavy patent royalties to be paid.

Another cause is the B. B. C. itself, which, from the very first, has adhered to what has become known as its "crystal policy," which has for its aim the establishment of broadcasting stations in such number and fashion that the entire population shall be within range of at least one station on a crystal receiver. Even under the projected new regional high-power station scheme, this policy has not been lost sight of.

Lest this crystal policy should be considered retrogressive, it may be mentioned that the workingman's wages are lower in England than in America, so that he cannot afford to buy expensive tube receivers, and a cheap crystal set is his only alternative.

THE NEW BROADCASTING AUTHORITY

Early this year a committee, presided over by Lord Crawford, and appointed to investigate the whole problem of broadcasting in Britain (with a view to determining whether the B. B. C.'s license, which expires on Dec. 31 this year, should be renewed, or whether the entire service should be reconstituted) delivered its report. This report was given wide publicity at the time, and most readers of RADIO NEWS have probably seen it.

The general trend of the committee's recommendations were that broadcasting, strictly as applied to Great Britain, is far too important a service to be administered in a manner in any way haphazard; that it is inadvisable for the service to be run by a private company or by the radio industry; that, on the other hand, it is inadvisable that the service be administered by the government (nationalized). It recommended, therefore, that the permanent body controlling broadcasting should be a public corporation of a semi-governmental character, to be directed by five or seven commissioners, who should be experienced business men with no other attachments or interests in the radio industry. These commissioners, it also recommended, should be chosen and appointed by the government, and well remunerated for its services. The present shareholders in the B. B. C. are to be bought out by the government.

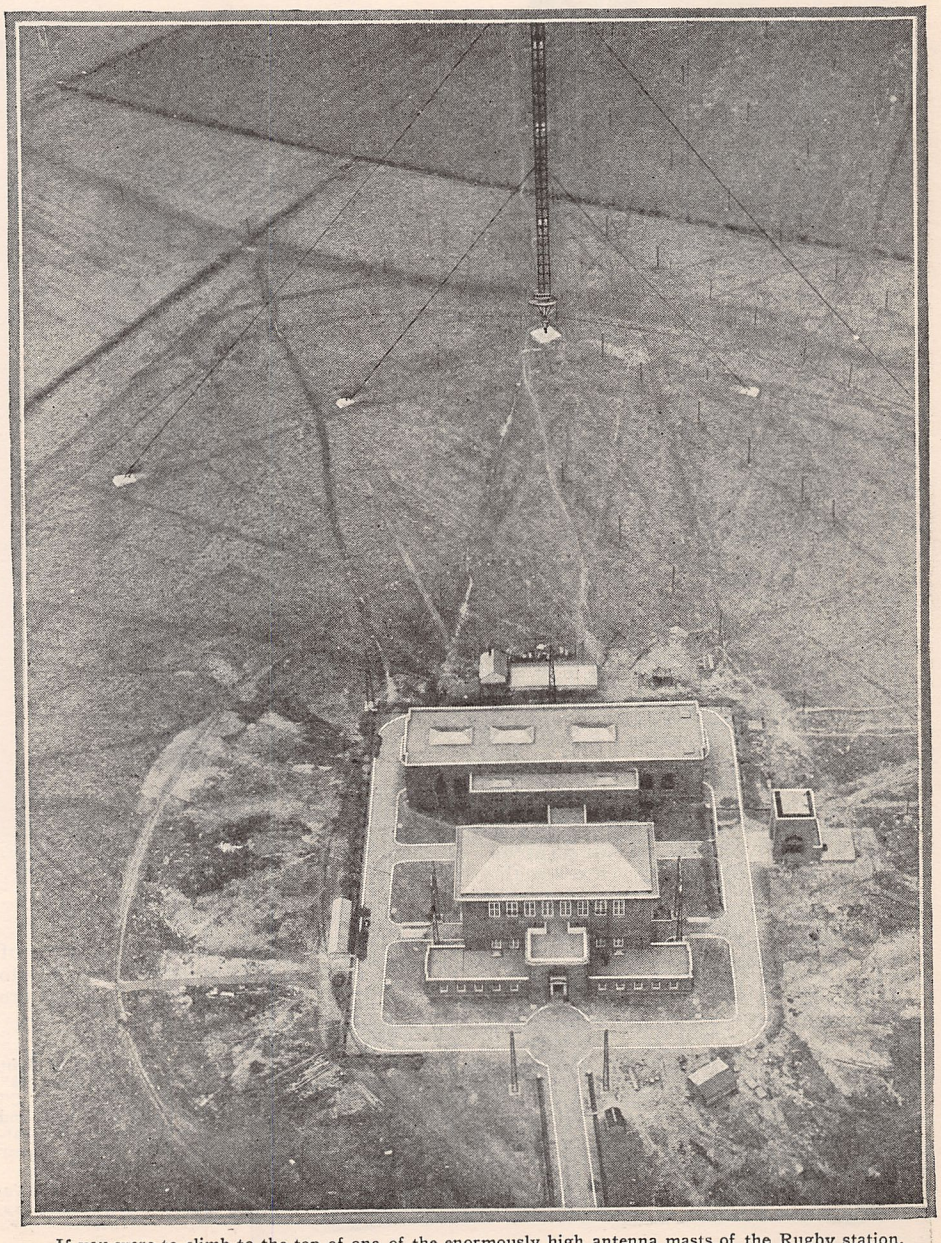
So far, so good. The report, although not entirely satisfactory to all the interested parties, was generally hailed as being sound, and the recommendations were considered a good move in the direction of stability, and approved. There remained only the selection and appointment of the commissioners and their installation in office. On adopting the report, the administration promised that the appointments would shortly be announced.

Up to date, however, these appointments have not been announced, which fact has given rise to a great deal of adverse comment, rumors, and intense dissatisfaction among all concerned. There are signs that the administration is not adhering to the spirit of the Crawford report; that political place-seekers are busy wire-puiling for appointment as broadcast commissioners; that the civil service is insinuating its way into the B. B. C. on the pretext of gathering information preparatory to the handing over of the broadcasting service to the "semi-governmental" body.

The whole situation, from a political point of view, is causing many people to fear that the new B. B. C. will be, in effect, a nationalized affair, run by permanent civil service officials while nominally directed by commissioners, whose appointments will be of a somewhat similar nature to those of the heads of other government departments. As a result, there is fear of bureaucratic methods, stodginess of the whole broadcasting service and other similar evils, which will lead eventually to the decline of broadcasting instead of to its development.

The administration agreed to retain practically the entire B. B. C. staff as it stands, but there is evidence that the present head of the B. B. C., J. C. W. Reith, who is responsible for building up the service to its present level, will not receive an appointment as a commissioner of the new controlling body, but perhaps be demoted and expected to work under these directors. It is considered that such a step would be one

(*Continued on page* 550)



If you were to climb to the top of one of the enormously high antenna masts of the Rugby station, this view of the station would be your reward.

Radio Batteries and Their Care

Concerning Particularly the Intelligent Use of Batteries

By M. L. MUHLEMAN

STORAGE and dry-cell batteries are still one of the most practical, efficient and economical sources of electrical power for the operation of radio receivers; and in all probability they will continue to be for some time to come. The reason is that batteries are the simplest source of *pure* direct current. Notwithstanding this, radio batteries have been the target for a great deal of undue criticism. From the point of view of the average radio fan, radio batteries are Jonahs and their use is suffered only for the want of something better. The fan argues that storage batteries, though rugged enough in construction, are delicate affairs and open to numerous ills, if not given proper and constant care. Likewise, dry-cell batteries, though they require no care, are very short-lived and become noisy much before their time is up. Then there is the replacement expense to be considered. All of which allegations are true to some extent, but far from being serious in cases where the batteries are *intelligently handled.*

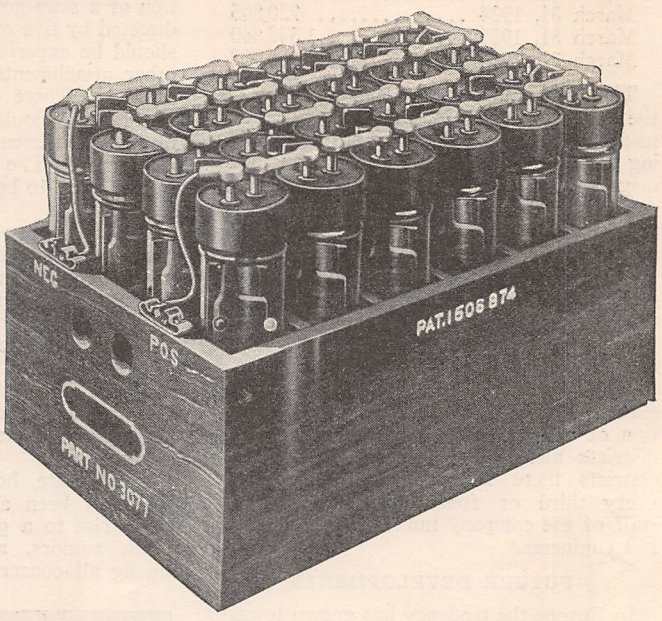
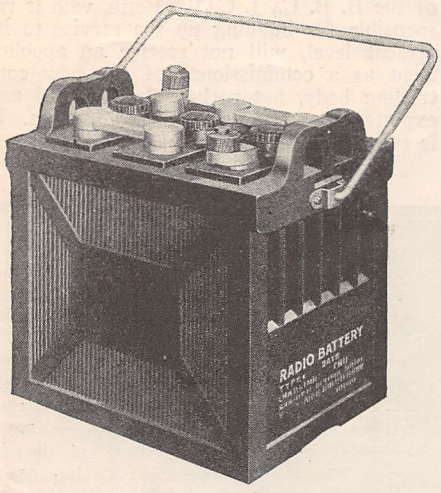


Fig. 7. A 48-volt storage "B" battery of the acid-solution type. It has a capacity of 6,000 milliampere hours at a 25-milliampere rate, which makes it practical for use in connection with a receiver employing a power amplifier. The cells are so designed that water has to be added only once a year. An "automatic hydrometer" is included in one of the cells to show the average condition of charge of the whole unit.

Photo courtesy Willard Storage Battery Company.



A typical high-capacity storage "A" battery for use with multi-tube sets.

Photo courtesy of Vesta Battery Corporation.

In spite of all the informative literature distributed by battery manufacturers, set owners continue to disregard the most vital points relative to the care of their batteries. One person will religiously charge his battery at regular intervals, but never think of keeping the fluid (electrolyte) up to the proper level in each cell. Another person may be "bugs" on the subject of water-level but charges his battery only when its state is evidenced by the erratic operation of his radio set, and end by testing each cell with a voltmeter with no load on the battery or letting the current run in until the cells commence to gas freely. And so on. Ignorance is also often shown in the purchase of dry-cell batteries. With a bit of care in the selection of the type of batteries to be used with a given set, the over-all expense can usually be cut in half.

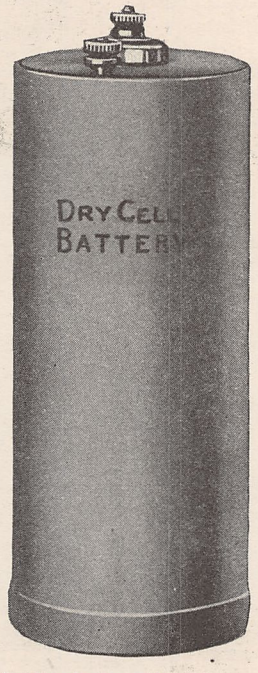


Fig. 1. A 1½-volt dry cell. One or more can be used as an "A" battery for tubes with low filament-current consumption. Properly, a "battery" means several cells; but the common usage permits us to call one a battery if it functions as such.

SIMPLE ADVICE NEEDED

Possibly the information on the care of batteries has not been properly presented to the radio fan. In manufacturers' literature and in magazine articles there may have been too much technical talk about oxidized, warped and "broken-down" storage-battery plates and causes the effects of deterioration of dry-cell batteries, etc.; so that the sum of knowledge possessed by the layman reader was equal to that known prior to the reading. At any rate, such information is of no special benefit to the average radio fan, and certainly of little importance.

What he wants to know is, "What do I have to do to get the most out of my batteries and what do I need to do with them? Also, what advantages, if any, have my batteries over other devices serving the same purpose?" It is the purpose of this article to answer just these questions and to be very, very emphatic in pointing out that *if batteries are used in the right way they require no special care.*

CHARACTERISTICS OF BATTERIES

It is characteristic of every battery to "run down." How soon it runs down depends on, first, how much current it had to offer, and second, on its condition of "health." A storage "A" battery having a capacity of 60 ampere-hours will not have as much current to give as a battery with a

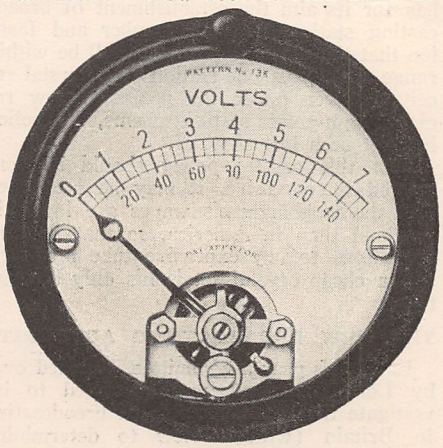


Fig. 3. A double-scale voltmeter, particularly useful for measuring the voltage of "A," "B" and "C" batteries. The switch at the top of the meter is used for changing from the low- to the high-scale reading.

Photo courtesy of Jewell Electrical Instrument Co.

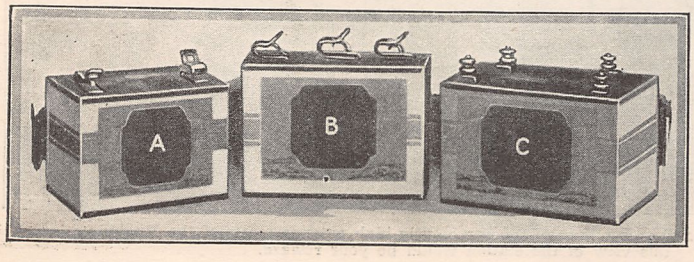


Fig. 2. From left to right are shown a small size "B" battery, a dry-cell "C" battery of low voltage, and a high voltage "C" battery for use with a power amplifier tube.

Photos courtesy of National Carbon Company, Inc.

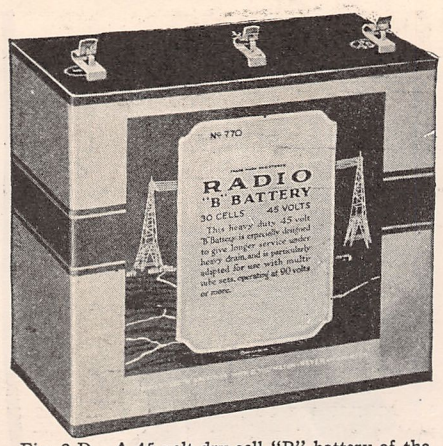


Fig. 2-D. A 45-volt dry-cell "B" battery of the heavy-duty type, an economical source of "B" current for single-tube or multi-tube sets. A large battery of this type is actually the cheapest in the long run.

Photo courtesy of National Carbon Co., Inc.

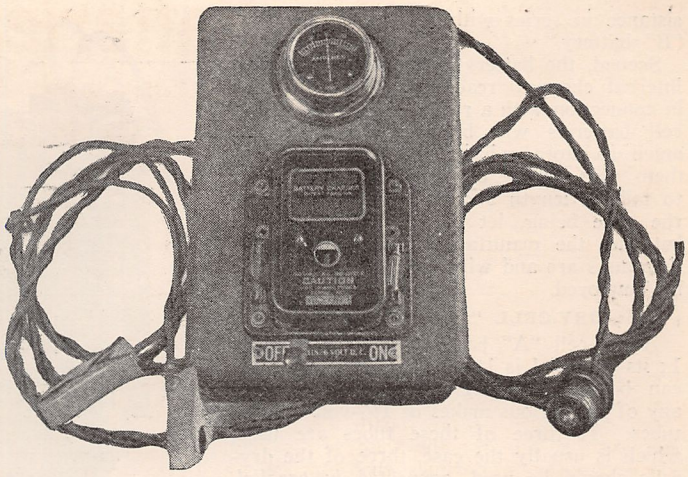


Fig. 9. A storage-"A"-battery charger, employing a very efficient form of mechanical rectifier. It is rated at 5 amperes but commences the charge at a higher rate, thus decreasing the length of time necessary to bring the battery up to full charge. It is for use on A.C. lines only. The ammeter at the top indicates the amount of current flow.

Photo courtesy of Niles Manufacturing Co.

capacity of 90 ampere-hours; yet the 60-A.H. battery might last longer than the 90-A.H. battery, if it were *healthier*. Likewise, a little dry-cell "B" battery will not last as long as a large one, normally; though it might last longer if the large battery were defective or had started to deteriorate internally for some reason.

We have large batteries and small batteries and it is very important that we know what size should be used with our sets. There is no advantage in employing a high-capacity storage "A" battery in connection with a one- or two-tube set. It is true that it would not have to be re-charged as often as one of low capacity, but it is intended for heavier work and would not be functioning under conditions for which it was designed. It would be bad practice to use a storage battery of very low capacity for lighting the filaments of an eight-tube set, because too much current would be drawn from the battery at one time. It is not built to deliver *high amperage,* or in other words, a large volume of current, and it would have to be re-charged too often.

All of the above is just as true in connection with "B" batteries. If the set uses a lot of "B" current, large "B" batteries should be used; they are much cheaper in the long run. However, if the set draws a very small amount of current, there is no saving in using very large batteries. We will cover these points in detail, later.

RATING OF BATTERIES

We have already said that a battery will hold so much current and no more. In connection with storage batteries we speak of their capacity as being so many ampere-hours. What does that mean? Just this, A 60-ampere-hour storage battery will deliver (theoretically) 60 amperes of current for one hour, or one ampere for 60 hours, or two amperes for 30 hours. Say, you use three 201-A tubes and a 112 tube in your set. Each 201-A takes ¼-ampere of current, the 112 takes ½-ampere; the total current drawn is 1¼ amperes. Sixty divided by 1¼ is 48; the "A" battery should last 48 hours, theoretically. Suppose you use your set four hours each day; at the end of 12 days the battery would be run down. But we don't want the battery to run all the way down; when it is half discharged the voltage starts to drop and we want to keep the voltage fairly constant. Therefore, we cannot wait until the twelfth day to re-charge it.

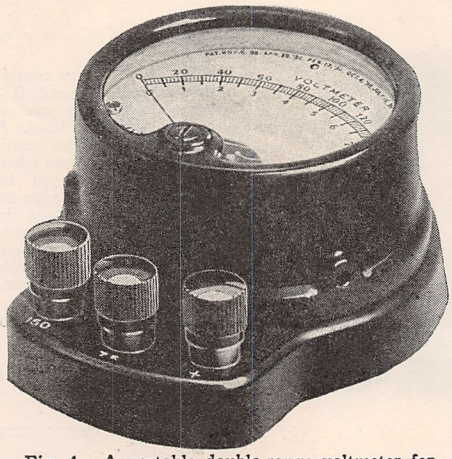


Fig. 4. A portable double-range voltmeter for testing all types of "A," "B" and "C" batteries, or other direct-current voltage sources. There is one negative binding post and two positive binding posts, low- and high-voltage.

Photo courtesy of Weston Electrical Instrument Corp.

The time to re-charge is dependent on the relative condition of the battery; it might be the sixth or the seventh day. We cannot rely on figures, such as those above, to determine the time for re-charging, for we do not know how the battery is faring; we must test it. But we *can* figure out the capacity of the battery best adapted to our sets. We will get back to that later.

It is somewhat the same with dry-cell "B" batteries. They are good just so long as they do not drop below a certain voltage. When they do drop considerably, two things happen. First, the *resistance* of the battery increases materially. This alters the "circuit constants," unless high-capacity by-pass condensers are used, and consequently affects the operation of the set. The same effect could be created by connecting a high re-

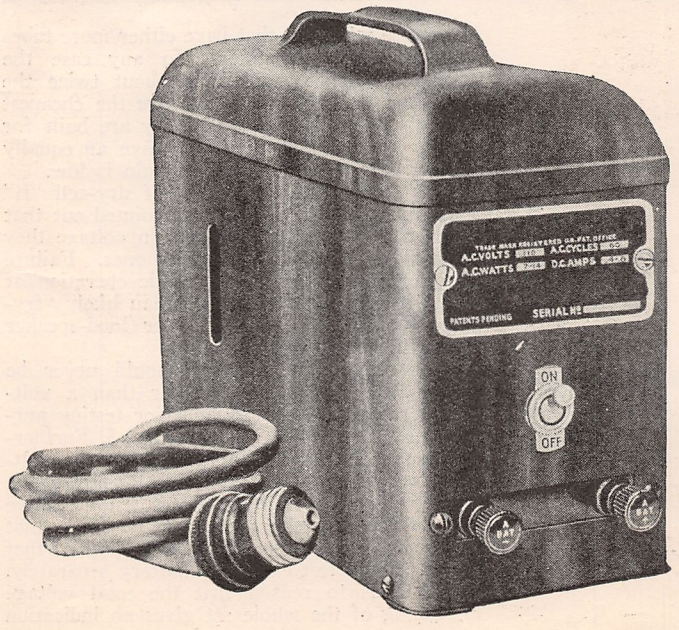


Fig. 15. (Left) An "A"-battery trickle-charger for use on A.C. lines. It employs an electrolytic rectifier. Three charging rates are obtainable, controlled by a switch inside the case. The charger is turned on and off by the toggle switch on the front of the case. It is possible to operate the receiving set while the charger is on.

Photo courtesy of Forest Electric Company.

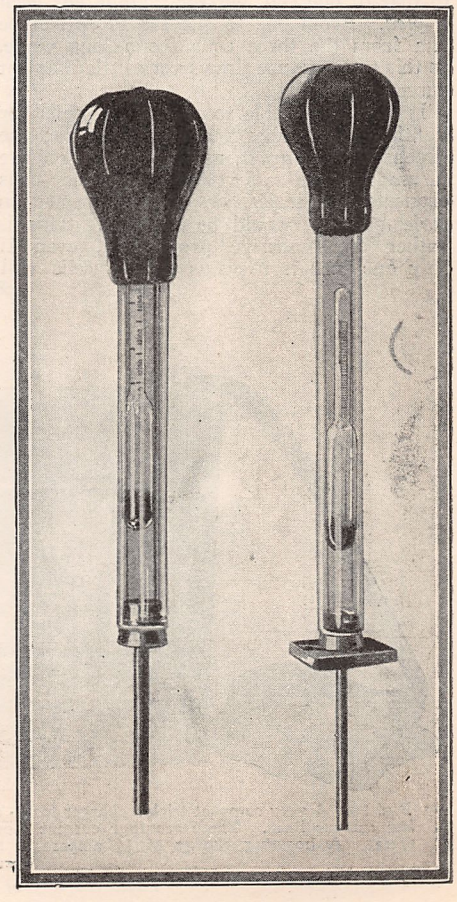


Fig. 6. (Right) Two typical hydrometers for testing the specific gravity of the electrolyte solution in storage "A" and "B" batteries.

Photos courtesy of E. Edelmann & Co. and Ala Manufacturing Co.

sistance in series with a new or "healthy" "B" battery.

Second, the battery becomes noisy due to internal chemical reactions. Its useful life in connection with a radio set is ended. Dry-cell batteries will bear watching just as much as storage batteries. We must test them; this will be explained when we come to talk at length about these batteries. For the time being, let us see what types of batteries the manufacturers offer us, what their uses are and when and where they can be employed.

DRY-CELL "A" BATTERIES

A dry-cell "A" battery is shown in Fig. 1; its potential is 1½ volts. Therefore, one can be used for lighting the filament of any of the various makes of 1½-volt vacuum tubes. If three of these tubes are used, which is usually the case, three of the dry-cells should be used, connected *in parallel*. With this arrangement the *current capacity has been tripled*, but the voltage remains at 1½.

Three of these dry-cells connected *in series* can be utilized for lighting the filaments of 4½-volt tubes of the 199 type. In this case the current capacity is equal only to that of one cell, but *the voltage has been tripled*. From one to six 199 tubes can be run from the three cells for a long while, as this type of tube draws very little filament current.

It is not advisable to employ dry cells for lighting the filaments of 6-volt tubes; the expense is too great, as these tubes require ¼ ampere each at 5 volts and four dry cells connected in series, or eight connected in series-parallel, would be required. This is rather an expensive proposition, even if only one tube is used, as the dry-cells will last but a short while; the total current capacity of the cells is not high enough for these tubes. However, dry cells serve their purpose well in connection with portable sets.

Fig. 11. A 2-ampere combination storage-"A and B"-battery charger for use on alternating-current lines. It is shown charging an "A" battery. When "B" batteries are to be charged a lamp is screwed into the receptacle on the front of the case. It will charge 2-, 4-, or 6-volt "A" batteries, or 24- to 96-volt "B" batteries in series.
Photo courtesy of General Electric Company.

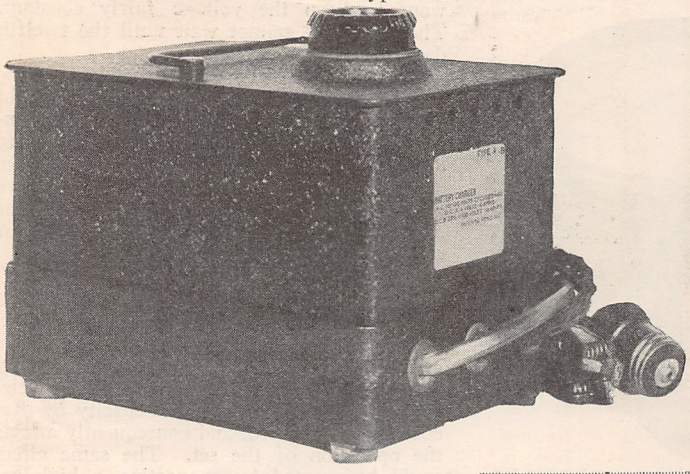


Fig. 12. A full-wave combination storage-"A and B"-battery charger for use on alternating-current lines. A lamp is placed in the receptacle on top of the case when "B" batteries are to be charged. It will charge 96 volts of "B" battery in series at a 1/10-ampere rate, or higher, depending upon the lamp used; and a 6-volt "A" battery at 3 to 4 amperes.
Photo courtesy of Liberty Electric Co.

DRY-CELL "B" AND "C" BATTERIES

Dry-cell "B" and "C" batteries have definite relations to each other. The "C" battery is a cooperative partner, as we shall soon learn. Both types are similarly made, each being composed of a number of small cells connected together. There are 22½-volt, and 45-volt dry-cell "B" batteries; but they are not all of the same size or current capacity. Some are quite small (see A in Fig. 2) and are for use with one, two- or three-tube sets. There are larger types (See Fig. 2-D) with high current capacity for use with sets that have either more tubes or a power amplifier. In any case the larger batteries will have about twice the life of the small ones and are the cheapest in the long run. Though they are built for heavy-duty work, they will have an equally long life when the current drain is low.

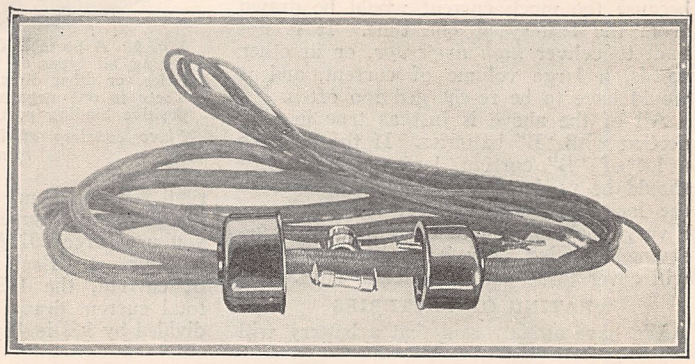


Fig. 24. Here is a battery cable with a small composition casing containing two small fuses, one in the "A" battery circuit and the other in the "B" battery circuit. These afford protection from possible damage in the event of a short circuit.
Photo courtesy of Belden Manufacturing Company.

We have already spoken of dry-cell "B" batteries running down, and pointed out that when they fall below a certain voltage they should be replaced with new ones. Failure to do this will result in erratic operation of the receiving set and more than likely "frying" noises in the phones or loud-speaker will be heard.

Dry-cell "B" batteries should never be tested with any device other than a voltmeter. Voltmeters suitable for testing purposes are shown in Figs. 3, 4, and 5. Furthermore, it is not advisable to leave the voltmeter *connected across the batteries;* use it only when you wish to determine the relative condition of each group of cells. Note that we say *relative condition.* That implies that you should test each "B" battery separately. It stands to reason that the total voltage reading of the whole set gives no indication

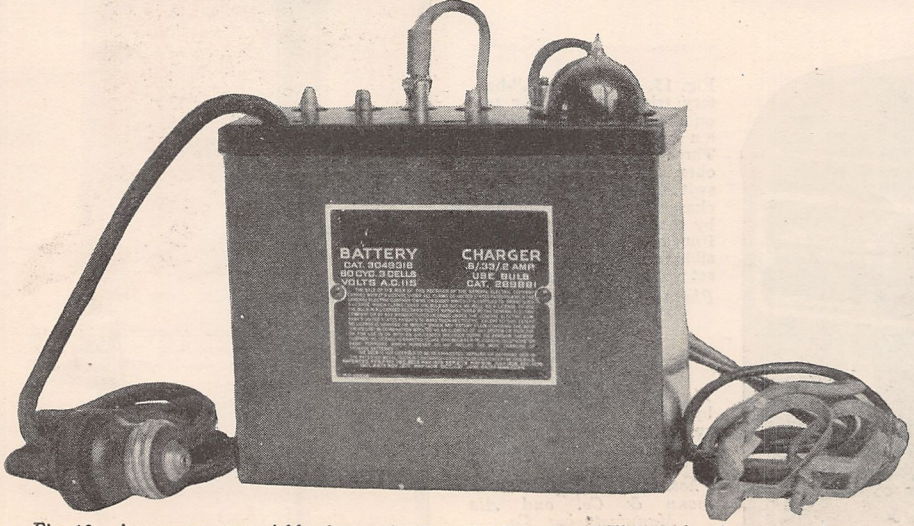


Fig. 13. A very compact trickle charger for 4- or 6-volt storage "A" batteries, for use on alternating current lines. There are four current taps, on top of case, allowing for different charging rates. A boosting charge of ½ ampere is obtainable. It can be run with the receiver in operation.
Photo courtesy of General Electric Co.

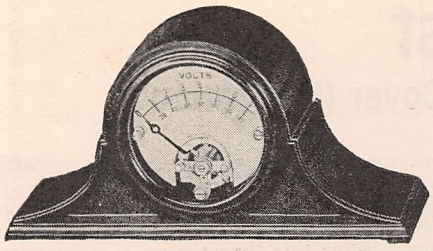


Fig. 5. A portable-model double-range direct-current voltmeter for testing "A", "B" and "C" batteries.

Photo courtesy of Jewell Electrical Instrument Co.

as to the condition of each individual battery.

As an example; suppose you have three 45-volt "B" batteries in use with your set and that the total voltage reading is 118. The individual voltage values might well be 45, 43 and 30. The first two are in excellent condition but the third is fit only for the ash heap. *It is a hindrance to the two healthy batteries,* because it is connected *in series* with them. Generally it is time to discard a dry-cell "B" battery when its voltage has dropped 30 per cent. from the original value. The voltage readings should be taken while the radio set is in operation, so that there is a "load" on the batteries.

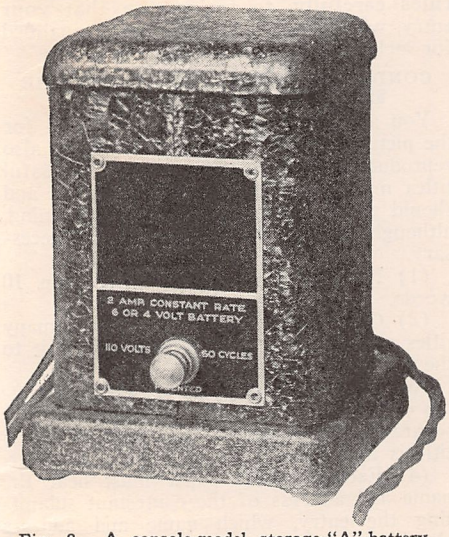


Fig. 8. A console-model storage-"A"-battery charger with a 2-ampere rate, sufficient for most purposes. It employs a very efficient form of mechanical rectifier.

Photo courtesy of Niles Manufacturing Company.

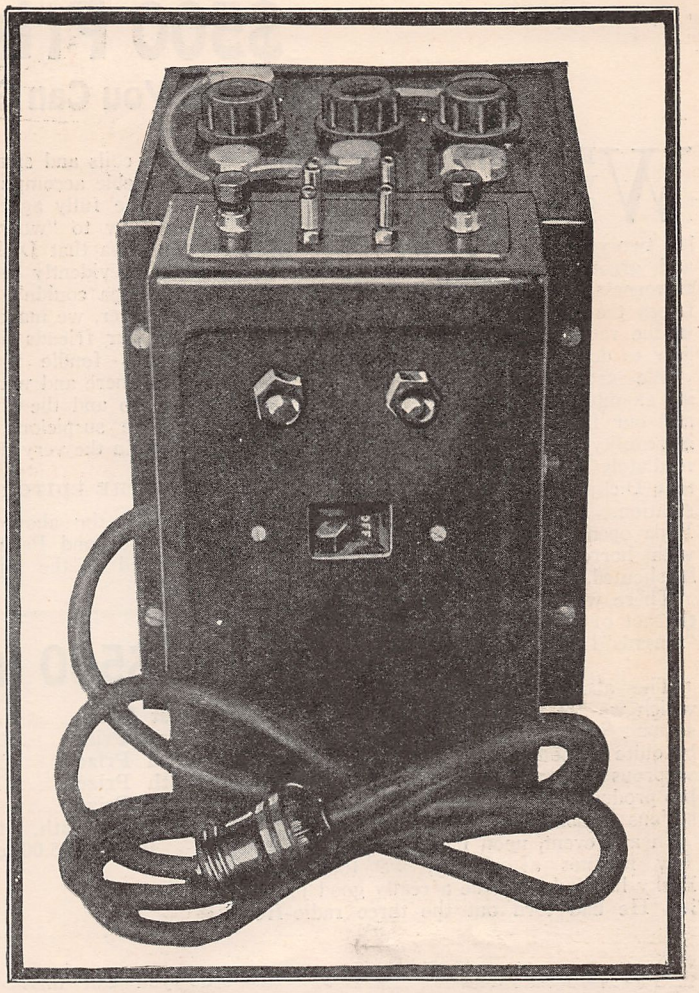


Fig. 17. The Autopower, an "A" power unit composing a low-capacity storage "A" battery and a trickle charger with four current taps. It is for use on alternating-current lines. The on-and-off switch on the front of the case automatically disconnects the receiver when the battery is put on charge; though it is possible to charge the battery while the set is operating without experiencing bothersome hum. The advantage of the voltage taps is that one can determine the average amount of "A" current used by the receiver each day, and so set the charging rate that the "A" power unit will be completely replenished at the time the set is again used.

Photo courtesy of Westinghouse Union Battery Co.

ECONOMY OF CURRENT

Now there comes the question as to how we can conserve our "B" batteries, how to get the utmost in service from them? Enter the "C" battery. We have learned that all batteries hold so much current and no more. If we take out the current in large quantities it is apparent that the battery cannot last as long as if we were to take out small quantities at a time. Our problem is to save the current; to use no more than is absolutely necessary for the efficient operation of the set.

First, we must consider the question as to why one five-tube receiver uses more "B" current than another. The answer lies in the fact that the respective grids of the vacuum tubes, in the case where excessive current is drawn, are not maintained at *a sufficient negative voltage,* and at intervals may even swing over to a low value of positive voltage. When the negative voltage is low or when the voltage is positive the "B" current flowing is greatly increased. This excess flow of current is of no value in the operation of the set; in fact it is a detriment.

By increasing the negative voltage on the grid of a tube the "B" current can be decreased. *The greater the negative voltage on the grid the smaller the flow of plate current* from the "B" battery. So, by using a "C" battery with its negative post connected to the grid of a tube, we can cut down on the amount of current being drawn from the

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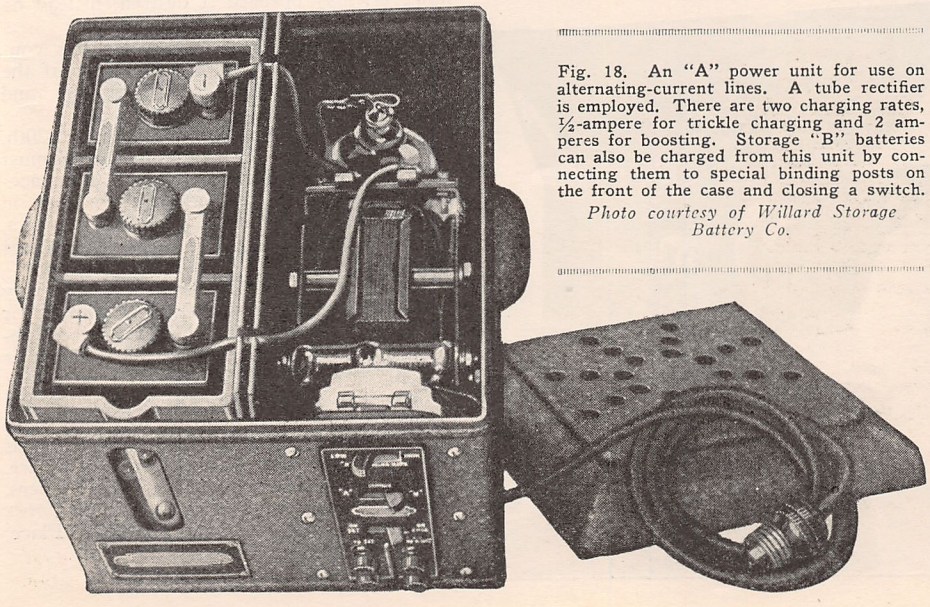


Fig. 18. An "A" power unit for use on alternating-current lines. A tube rectifier is employed. There are two charging rates, ½-ampere for trickle charging and 2 amperes for boosting. Storage "B" batteries can also be charged from this unit by connecting them to special binding posts on the front of the case and closing a switch.

Photo courtesy of Willard Storage Battery Co.

Fig. 10. An "A" battery charger employing two rectifier tubes. There are two charging rates, 2½ amperes when one tube is used, and 5 amperes with both tubes in use.

Photo courtesy of Valley Electric Company.

$500 Prize Contest

What Is the Best Title You Can Suggest for Our Cover Illustration?

WE must confess that we have always had a weakness for bright children; so the other day, when we visited one of our old friends, his two-year-old went through all his paces and greatly elated us with his marvelous cleverness. Fond Papa even went so far as to say that little Dicky had no trouble tuning in the radio, having been shown only once how to do it, the night before.

We greatly marveled at this astonishing example of brain power in one so young, and our face probably showed some of the incredulity we felt; because Fond Papa immediately proceeded to the library, stating that Dicky himself would give us a demonstration. No sooner said than done. Fond Papa opened the door, but stood transfixed with horror, on the threshold. "Dicky!" he shouted, "What do you call this?"

There was Dicky, sitting on the table, in the act of "experimenting" with the radio's "innards"!

* * * * * * *

The above stars represent the curtain which we are forced to draw over the subsequent proceedings, which were enlivened by quite a good deal of appalling howls and vigorous language that could not at all well be produced here. It might get us into serious trouble with the postal authorities.

In any event, upon inspecting the radio a few minutes afterwards, we found that Dicky had indeed made a really good job of it. He had torn out the three radio-frequency coils and smashed two bulbs—not at all a feeble accomplishment for a youngster—and we fully agreed that Dicky certainly knew how to "work" the radio. We told Fond Papa that Dicky worked the radio so well he evidently worked it to death; but Fond Papa couldn't see the joke at all.

However, we made a mental note to warn all of our friends never, never to let two-year-olds fondle radio sets, except when we are there and within arm's reach of both the radio and the youngster; but even then we have suspicions that disaster may be lurking in the very next wave.

THE EDITOR IS "STUMPED"

Before the above curtain of stars, we said that Fond Papa was so surprised that he yelled at the top of his voice, "What do you call this?" We have given the matter quite a good deal of cogitation, for some time; but after the cover of RADIO NEWS had been duly painted and finished words failed us as to "what do you call this?" We could think of no adequate wording for the title on the cover. We admit we considered a few, as, for instance, *"The Young Radio Experimenter," "Getting Inside Radio Information," "A 'Wireless' Radio,"* and other similar titles; but then we had to catch a train for our yearly vacation, and we thought it best to "Let George do it," this time anyway. It will be worth $500 to us, *not* to puzzle out a title.

$500 In Prizes

1st Prize	$300.00
2nd Prize	100.00
3rd Prize	50.00
4th Prize	15.00
5th Prize	10.00
6th, 7th, 8th, 9th and 10th Prizes, $5.00 each	25.00
	$500.00

THE READER WILL DESCRIBE IT

And so, there you are. Here is the picture of Dicky, engrossed in his scientific investigation, and Fond Papa, who does not approve of the young scientist's research methods at all. We leave it entirely to you to find out what the picture is all about, because we know that you can get up a much better title than the poor, overworked editor can, at any time.

That is all there is to it. Just study the picture carefully and see what it suggests to you. Remember, also, that this is a radio magazine, and the title really should have something to do with radio. The cleverer your title is, the bigger will be your chances to win the first prize.

Now $300 for writing just a few words is not a bad proposition at all, as we see it; and we are sure that you who read this will be the lucky one and get the first prize—but then, even if you do not win the first prize, there are other good prizes not to be sneezed at, and well worth going after.

Please do not jump at conclusions about the nature of this contest, but **read the rules carefully,** to make sure that your entry, whatever it is, will not be disqualified for lack of compliance with them.

CONDITIONS AND RULES OF THE $500 COVER PRIZE CONTEST

You are asked to write the best title for the picture on the front cover, which is also reproduced on this page. The successful titles must be pertinent to the picture and should preferably have some radio meaning, although the latter is not absolutely necessary.

(1) No title may contain more than 10 words.

(2) Contestants may submit as many titles as they care to. There is no limit to the number.

(3) Every title must be clearly *typewritten or printed, not written in longhand,* on a separate sheet of paper. Not more than one title is to be written on one sheet of paper.

(4) Each sheet of paper must bear the name and address of the contestant submitting the entry, which name and address should be printed or typed on the same page; no other matter should be included. *Do not write on the reverse side of the sheet.*

(5) Penciled matter can not be entered in this contest.

(6) All entries must be submitted on *flat* sheets of paper, of such size that it is not necessary to fold them into the envelope. No folders or rolled heavy paper will be admitted to contest; government postal cards, however, may be used if desired, instead of enclosing the entries in envelopes.

(7) Anyone is eligible to enter this contest, with the exception of employees of the Experimenter Publishing Company and their relatives.

(8) This contest closes December 20th, 1926, at noon, by which time all entries must have been received at this office. Announcement of the prize winners will be made in the March, 1927, issue of RADIO NEWS, upon the publication of which the prizes will be awarded.

(9) Do not enclose the entries with any other communications to the Editorial or other departments of the Experimenter Publishing Co. This may result in the delay or loss of one, or both.

(10) The editors cannot send individual acknowledgments of entries, or enter into correspondence regarding them or the terms of the contest, which are given plainly here. Entries cannot be returned to the senders.

(11) Address all entries to Editor, *Cover Title Contest,* RADIO NEWS, 53 Park Place, New York City.

(*Continued on page* 600)

A Visit To A Condenser Factory

Details of the Manufacture of Filter and By-Pass Condensers

THE popularity of "B" battery eliminators has increased the consumption of filter condensers far beyond the former production of this type of condenser; and to meet this demand, a number of American manufacturers have installed equipment for their production. While the manufacture of this type of condenser is apparently simple to those experienced in its construction, there is a great amount of detail which is overlooked by the average fan. Each step must be carefully followed, and the finished product thoroughly tested, to insure the efficient operation of the eliminator in which the condensers are used.

In anticipation of this condition, one manufacturing company has installed what is believed to be one of the most efficient and best equipped plants for the production of filter condensers in the country. To accomplish this, there was secured a corps of engineers, who have specialized in the manufacture of filter condensers for a period of approximately twelve years. With this experience, they designed winding machines and laid out specifications for a filter condenser plant that would possess every available advantage and insure a product that would give dependable service wherever used. The importance of the proper paper and correct grade of foil was carefully considered, as well as the use of a thoroughly tested paraffin with which to seal the condensers during manufacture.

For the readers, who as users of filter condensers in "B" eliminators or by-pass

(*Continued on page* 570)

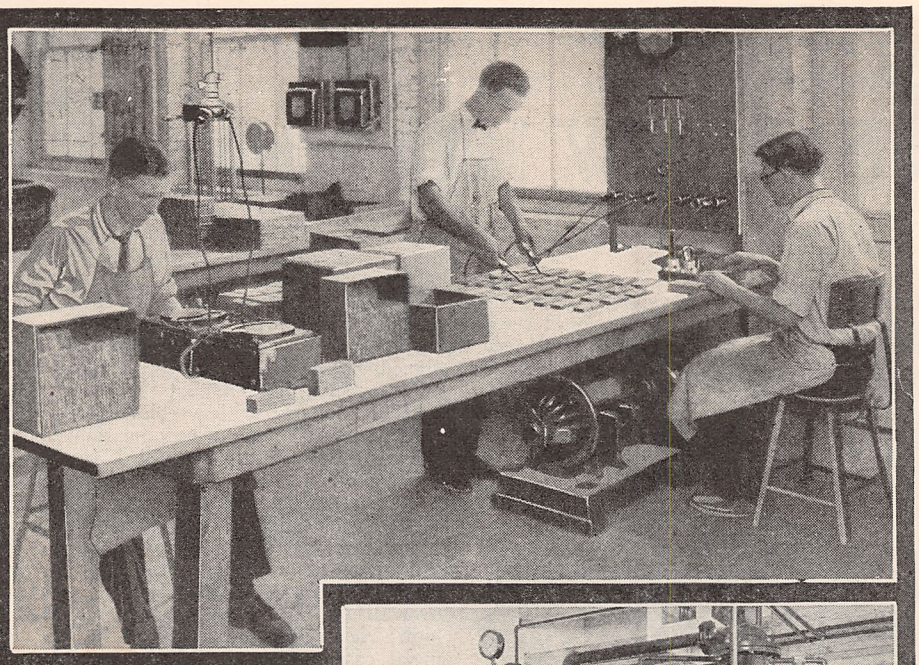


Fig. 6. (Above) Testing the condensers for capacity, insulation resistance and breakdown.

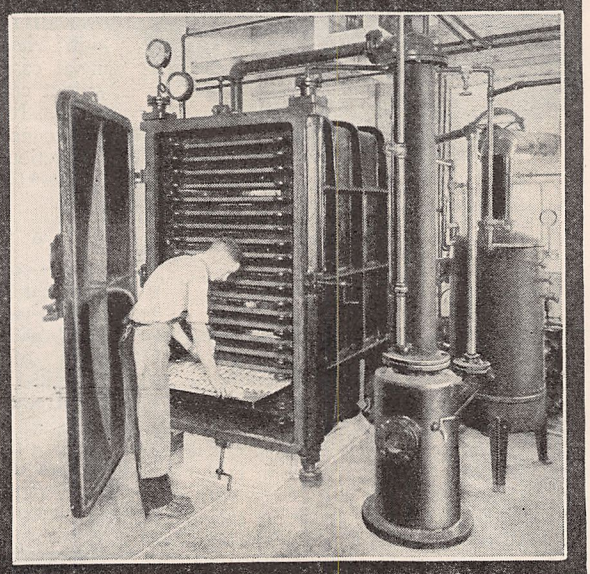


Fig. 4. (Right) The vacuum dryer and also the surface condenser and steam boiler, behind which is the steam-driven vacuum pump.

Photos by courtesy of Leslie F. Muter Co.

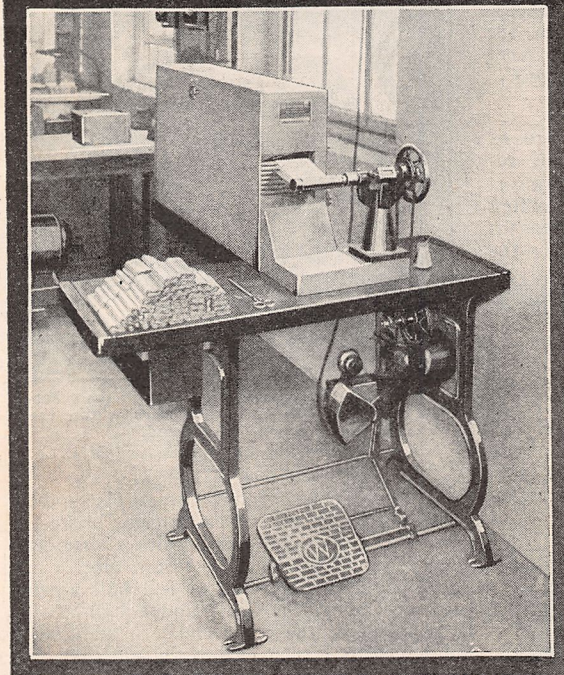
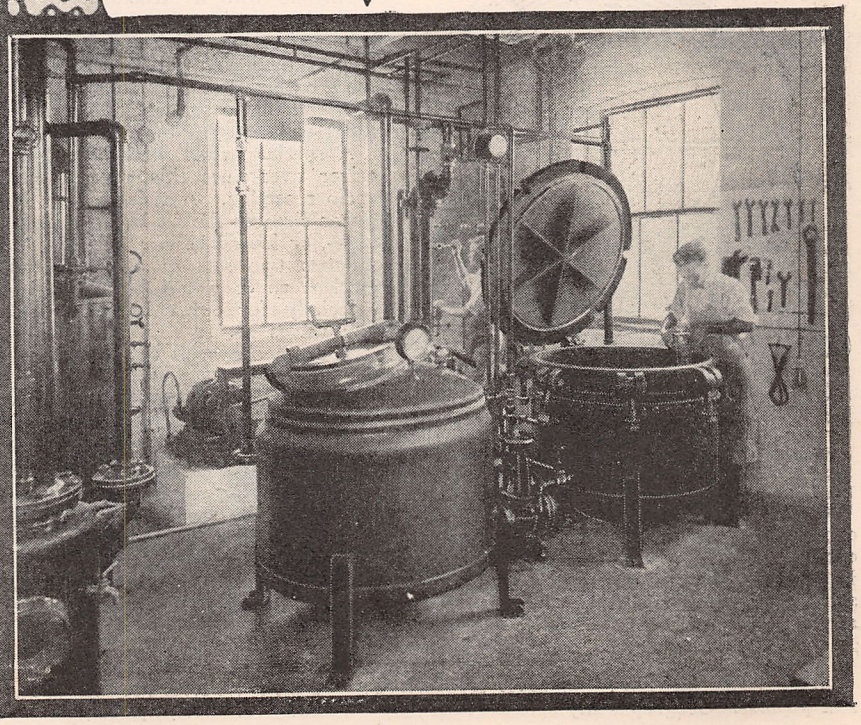
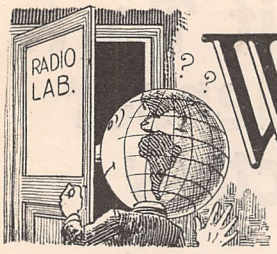


Fig. 1. (Above) The power winding machine for the making of fixed condensers. Notice the revolution counter for informing operator of the exact number of turns of paper and foil on the condenser, whose capacity is thus determined.

Fig. 5. (Below) Vacuum tanks in which the condensers are impregnated with melted paraffin.





What's New in Radio

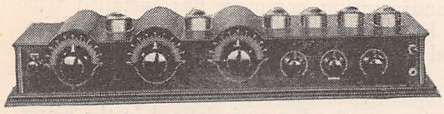
A SHIELDED 6-TUBE RECEIVER

Three stages of transformer-coupled audio-frequency amplification are successfully used in the set illustrated; and this method of coupling gives a tremendous amount of loud-speaker volume even on weak signals.

Three control dials are used, by means of which the three circuits are brought into exact resonance with each other and with the broadcasting station, with the result that full volume and true tone quality are obtained. Straight-line-frequency variable condensers are employed in this model, thus insuring sharp separation of all stations on the broadcast band from the lowest to the highest wavelengths.

The receiver is encased in an all-metal shield which serves as a protection for the vital parts and acts as an electro-magnetic shielding against outside interference.

The neutrostat is an ingenious device for varying the "B" voltage to suit best the exact wavelength being tuned. Thus weak



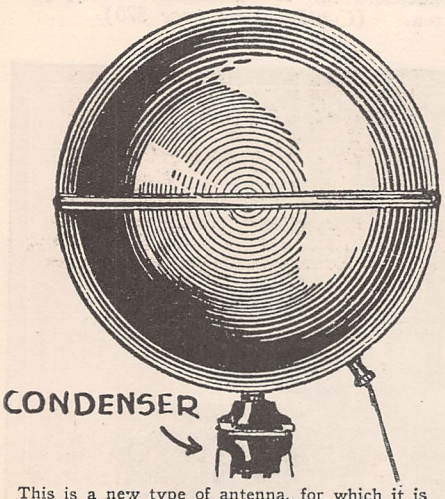
Not only the three stages of radio-frequency amplification, but the entire receiver is completely shielded.

Photo by courtesy of Neutrowound Radio Mfg. Co.

signals can be built up greatly in strength by controlling the oscillation on all wavelengths. All stations can be tuned in at the point of maximum intensity, which is immediately below the point of oscillation.

A UNIQUE ANTENNA

This spherical antenna, which is ten inches in diameter, is non-directional. It is built of metal having great electrical



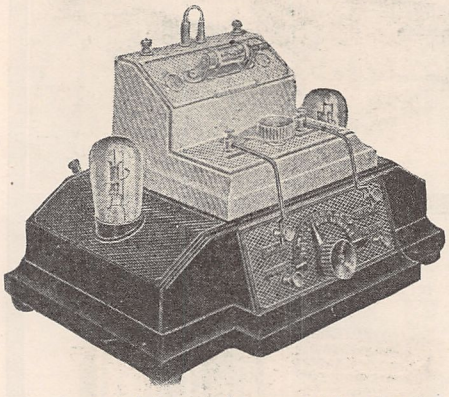
This is a new type of antenna, for which it is claimed that there is no directional effect observable in reception.

Illustration by courtesy of Yahr-Lange, Inc.

conductivity, receives all wavelengths, increases selectivity, and clarifies tone. It is said to reject a large part of the noise and interference collected by long-wire aerials.

AN AMPLIFIER FOR CRYSTAL SETS

Among English fans, the crystal set is still popular. Geographically speaking, England is a small country, and the numerous main and relay stations make crystal reception possible almost everywhere; but sooner or later the fan tires of phone-strength



As the crystal detector is very popular abroad, an English manufacturer is offering a unit with two A.F. stages which can be added to a crystal detector.

Illustration by courtesy of Brownie Wireless Co., Ltd.

signals and longs for good loud-speaker reception.

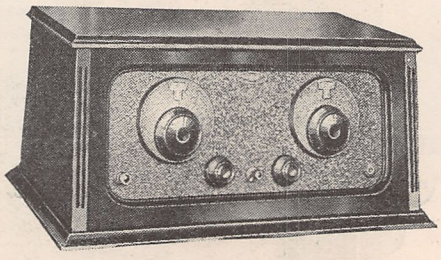
One English manufacturer has provided for this extension of the set, and produced a novel type of amplifier on which the existing crystal set is placed. Both crystal set and amplifier blend into a new larger set, and the alteration can be effected with very little trouble. The composition casings of both are of the same shade. The amplifier used is transformer-coupled and has two stages. The amplifier tubes appear at the sides of the illustration. In front of the base is the rheostat controlling the filament temperature of the tubes.—*C. A. Oldroyd.*

A DOUBLE-RANGE RECEIVER

Anyone with a structural knowledge of radio knows that the vast majority of receivers are more efficient on the lower wavelengths than on the high waves. Also that the set which brings in the high wavelengths well is hard to manage when tuned for the lower-wavelength stations.

A special switch incorporated in this receiver overcomes this general difficulty in radio reception. A twist of the thumb and finger changes the set instantly into either a high-, or low-wave set. Actually, the operator has two sets in one, and each is as efficient as it would be were it designed especially for either high waves alone or low waves alone.

The set shown is a six-tube, inherently-



By means of a special switch the range of this receiver can be easily transposed, from the high to the low wavelengths, and vice-versa.

Photo by courtesy of Splitdorf Electrical Co.

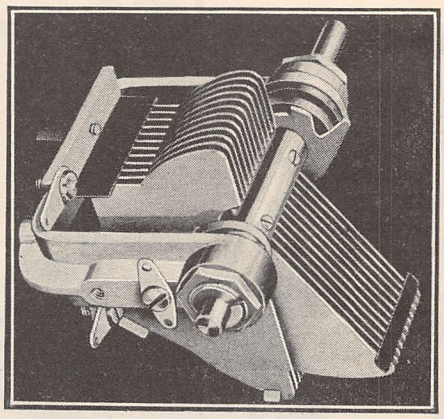
neutralized, two-control receiver having three stages of radio-frequency amplification, detector and two stages of audio. It is designed especially to meet the demand for a receiver small in size and easy to operate.

It is equipped with vernier tuning dials and straight-line-frequency variable condensers—the second and third condensers being controlled by a single dial; separate rheostats on the panel for controlling detector and radio-frequency tubes, and a rheostat on the sub-panel inside cabinet for controlling audio tubes.

The entire receiver is only 22 inches long over-all by 12¾ inches deep by 10 inches high; it has a sloping, crackle-finished, metal casement panel, and is encased in a walnut cabinet, lacquer finished in two-tone effect. It has a six-terminal cable for battery connections; the antenna and ground connections are made outside of the cabinet. The set is wired to permit use of power tubes.

A NEW CONDENSER DESIGN

The condenser shown is a new product designed to give the greatest possible separation between stations throughout the entire broadcast wave band. It combines features of the straight-line-capacity, the straight-line wavelength and the straight-line-frequency types into one condenser; applying their characteristics at the points on the dial where they are the most valuable. In size it is no larger than a straight-line-frequency condenser, requiring only 4 inches of panel space when open. Mechanically, it



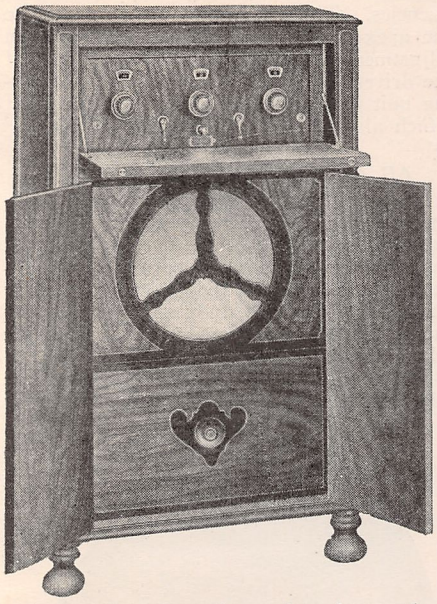
This condenser is designed to obtain the greatest possible separation of stations within the broadcast wave band.

Photo by courtesy of Hammarlund Mfg. Co.

has heavy non-corroding brass plates, held in position by tie bars, an exterior brake for holding the rotor in position, one-hole mounting with anchoring screw, clockspring pigtail rotor connection, a full ball bearing at one end of the shaft and a ball-bearing end-thrust at the other end. In addition to these there is provided a full-floating axle which supports no weight and may be entirely removed, and a longer axle substituted for connecting several condensers together. It may also be adjusted for coupling to other condensers, for applying a gear-type vernier to a single condenser, or for mounting a variable primary coil. A shaft of insulating material may be substituted for the metal shaft.

A LIGHT-SOCKET OPERATED RECEIVER

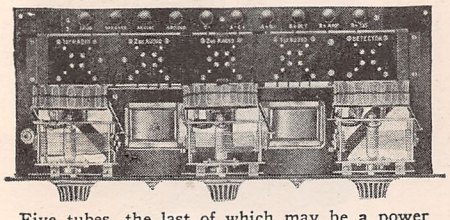
The all-metal panel and sub-panel are but two distinct features embodied in this receiver. Other points of great interest are: the telephone-cable wiring of the low-potential leads; the speedometer type of tuning controls which allow perfect ease in tuning; the auto-type rheostat controls which afford minute filament adjustment; the non-microphonic socket suspension; the exceptionally beautiful mahogany and walnut console cabinets with their built-in loud-speakers.



The console receiver shown above has ample space provided for the various eliminators at a sufficient distance from the set to escape any hum.

Photos by courtesy of Chas. Freshman Co., Inc.

This year, however, instead of arranging the circuit for use with standard tubes, the second stage of audio frequency amplification is designed to accommodate a power tube, if so desired. A step further ahead is also made by using a jack in the output of the first stage of A.F. amplification into which can be plugged a power amplifier unit; special heavy duty, non-distorting audio frequency amplifier transformers have been designed and employed with excellent results. "C" battery connections are also provided, and with an "A-B-C" Power Supply unit the entire receiver can be operated from the light socket.

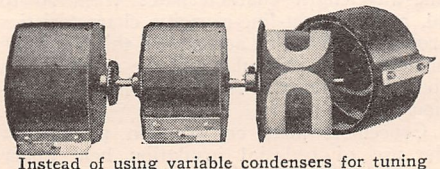


Five tubes, the last of which may be a power amplifier, with special coils for this circuit give excellent results in the console receiver shown above.

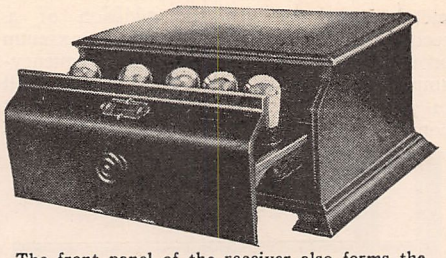
A VARIOMETER-TUNED RECEIVER

As may be seen from the illustrations, though this receiver uses a standard tuned-radio-frequency circuit, the construction of the set and the parts is unique.

In the first place, the tuning-in of stations is done by three variometers on the same shaft, rotated by the knob on the front of the cabinet, which serves also as a handle for the drawer in which the set fits. The internal construction of these variometers is clearly shown; there are two similar windings on the mica cylinder and two others on the internal circumference of the bakelite covering. These three variometers are in the grid circuits of the first three tubes, respectively.



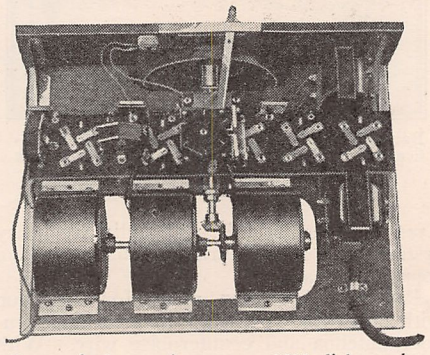
Instead of using variable condensers for tuning purposes the receiver's single-control dial operates these variometers.



The front panel of the receiver also forms the front of the drawer, a part of which is the sub-panel of the set.

Photos by courtesy of International Radio Corp.

These are also radio-frequency transformers; the only variable condenser in the hook-up is across the secondary of the transformer, in the first stage. This is necessary because it is impossible otherwise to compensate for the difference in the lengths of antennae used. Two stages of audio-frequency amplification give the necessary loud-speaker volume.

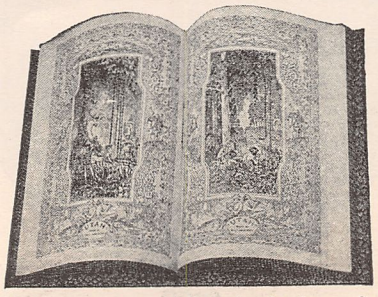


By employing variometers a 360° dial can be used; the lever at the front of the set controls a rheostat which also turns out the filaments of the tubes.

Stations may be logged by reading the numbers which show through the window in the front of the drawer just above the tuning knob. The condenser adjustment is inside the drawer, as it has to be varied only occasionally. The drawer need be opened only when this adjustment is made or tubes changed, the other tuning and volume adjustments being made from the front. Below the knob will be seen a lever for volume adjustment and also for turning off the set.

A TALKING BOOK

This speaker is rich and artistic in appearance, resembling an open book with hand-tinted pages done in sepia, finished in gold and brown morocco leatherette. It may be held in an upright position on an easel furnished with the speaker, or hung on the wall like a picture.



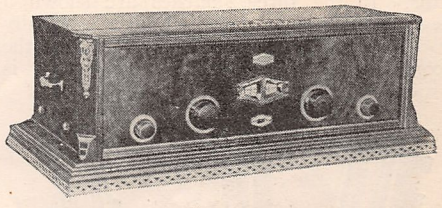
This loud-speaker, which is in the form of an open book, employs the paper of the page as a diaphragm.

Photo by courtesy of Utah Radio Products Co.

It employs new principles in sound reproduction. The electromagnetic unit is applied *tangentially* to the edge of a properly-curved membrane; thus differing from other speakers in which the diaphragms are moved by a piston-like action at right angles to the surface. The size is 17½x13½ inches.

A SEVEN-TUBE NEUTRODYNE

Completely shielded with heavy brass material, this set embodies all the patented Hazeltine features; the circuit employing three stages of neutralized R.F. amplification, detector and three stages of combination A.F. amplification of special design. It operates from a loop antenna, eliminating the use of outside aerial or ground, and is also adapted for use with light-socket power devices.



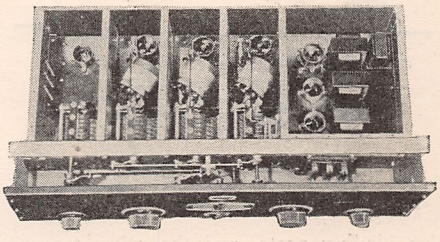
There are but two tuning controls on this aluminum panel, which is stained to represent the finish of wood.

Photos by courtesy of Howard Radio Co.

The operating panel is made of aluminum stained and grained to represent a rich walnut. A dual tuning control is used and the panel is constructed in such a way that the dial markings, calibrated in wavelengths, are visible through a window in the center of the panel. A small electric light concealed behind the panel makes them easily readable.

To give smooth, free movement and at the same time provide a hairline adjustment, the variable condensers are operated on two ingenious link-motion shafts, which are controlled by the two tuning knobs. There are no gears to get out of mesh or wear out.

This receiver is extremely efficient on extreme long distance signals and remarkable results have been obtained in steel and concrete buildings.



Although the circuit used is the neutrodyne, this set's controls are reduced to two by an ingenious system of gearing.

Inter-stage coupling and eddy-current losses are eliminated by the method of shielding employed. The R.F. units and detector are separated from each other by metal shields, and the three audio stages are placed in another separate metal compartment. All the shielding is tightly clamped together so that leakage from one stage to another is absolutely prevented.

Evidence of the effectiveness of the shielding was brought out in a series of tests in which effort was made to tune-in local station programs with the loop antenna disconnected; complete silence prevailed at all points on the dials.

NEW GERMAN ACCESSORIES

One of the chief things for which Germany is noted is the attention that its

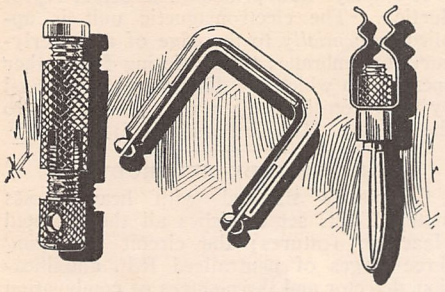


Fig. 1. A new type of German binding post is shown at the left, beside two types of spring connectors which are made to fit in it.

manufacturers have paid to the small details. In the three sketches are shown a few radio accessories that are especially useful for the home constructor and the experimenter. In Fig. 1, on the left, is

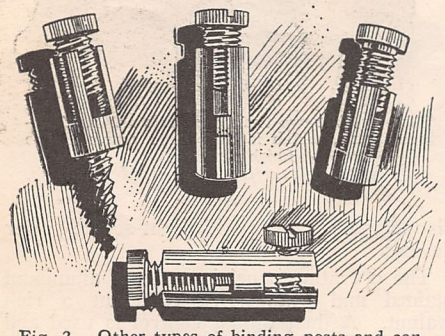


Fig. 2. Other types of binding posts and connectors from Germany, that should prove a great aid to the experimenter.

Illustrations by courtesy of A. W. Herbert

shown a binding post which may be attached to a panel or baseboard and connections made to it in a number of different ways; either by the shorting U-shaped connector or the plug, in which a resistor can be placed in the clip in its top.

The two figures at the left in Fig. 2 are

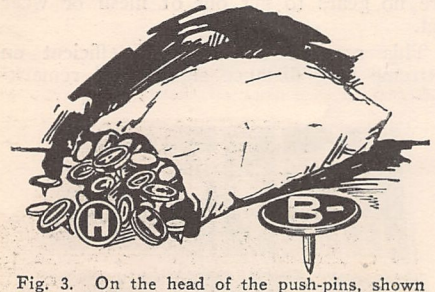


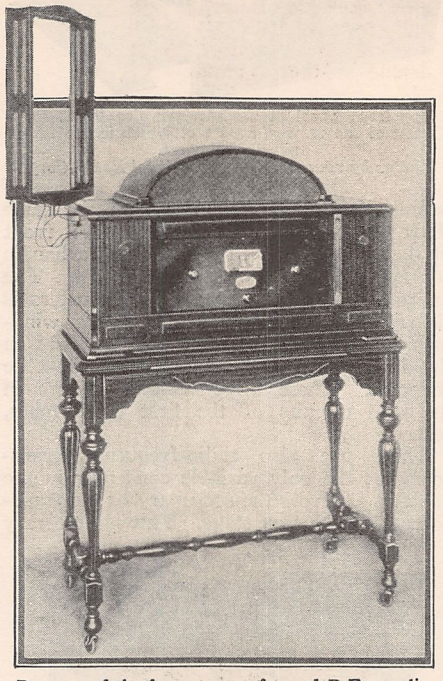
Fig. 3. On the head of the push-pins, shown in the above sketch, are engraved the different symbols, which may mark the terminals on a set.

also binding posts, and the other two are connectors which may be used instead of soldering wires together. In Fig. 3 are shown thumb-tacks, on the heads of which are engraved appropriate letters and figures, indicative of the binding-posts on a receiver.

A MULTIPLE-SHIELDING LOOP RECEIVER

This receiver includes four stages of tuned-radio-frequency amplification. All coils and variable condensers in this group are made to possess identical electrical characteristics, so that they are adapted to tuning by a single control. Adjustment of the loop or antenna circuit is accomplished by a second control, which assures the balance essential to the best possible reception.

A special advantage of this receiver is its multiple shielding, each circuit being completely isolated. Each coil has its own metal covering, with the addition of a second housing for those requiring maximum protection. Over the entire radio-frequency-amplifier system is still a third shield. All of these housings are made of the purest copper and sealed by a special process.



Because of the four stages of tuned R.F. amplification, this receiver gives remarkable results on a loop antenna.

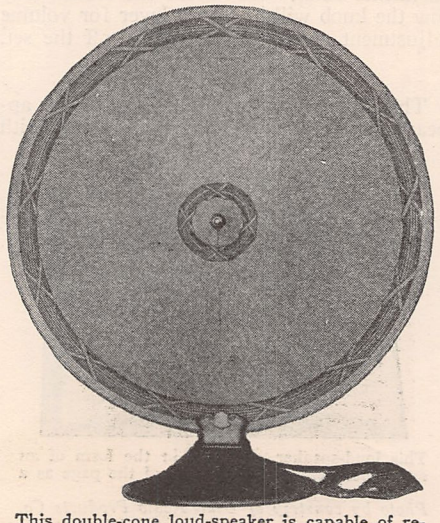
Photo by courtesy of Federal Radio Corp.

Even the detector tube and audio frequency system have their individual shielding of a copper steel alloy.

Provision has been made for operation with either the built-in loop or a short indoor antenna and counterpoise wire. With the loop no ground or counterpoise is necessary. A concealed and shielded switch facilitates the change from loop to antenna where desired. While a large outdoor antenna may be employed, its use is discouraged except under such rare conditions as exist only when static and electrical disturbances are almost entirely absent. Since the loop is remarkably sensitive and selective, it is entirely sufficient for reception over tremendous distances.

A POWERFUL LOUD-SPEAKER

This cone, is of the double-diaphragm, fixed-edge design. The parchment is of special grade selected after long experimentation, and treated to ensure immunity



This double-cone loud-speaker is capable of reproducing faithfully the output of a small set or a multi-tube receiver.

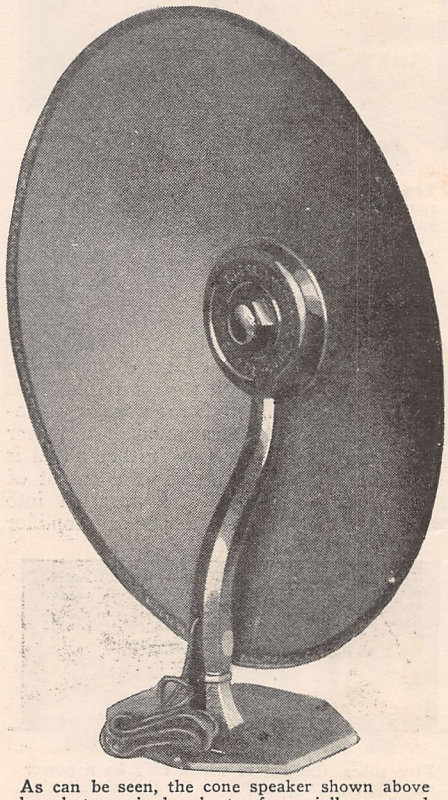
Photo by courtesy of Pacent Radio Corp.

to dampness. The driving unit is sufficiently delicate to handle the output of the smallest dry-battery receiver, even on weak signals, and sufficiently rugged to handle the output of any power amplifier. It responds to all electrical variations of the input, so that clear, realistic rendition, without slurring, blurring or blasting, is obtained. The driving unit has a balanced armature and responds to the full range of musical frequencies. The connecting rod, running to the apex of the cone, is provided with an adjustment to maintain proper position of the driver rod in the paper cone. The driving unit is mounted on a sturdy framework, which also supports the cone.

AN ADJUSTABLE LOUD-SPEAKER

The majority of the new cone loud-speakers which have appeared on the market this season are of the single-cone type; that is, instead of two cones fastened together at their edges, they have but a single sheet of paper, the apex of which is attached to the loud-speaker unit, and the edge, either free or fastened to a ring.

In the illustration a cone of the free edge type is shown. The construction of



As can be seen, the cone speaker shown above has but a single sheet of specially-prepared paper as a diaphragm.

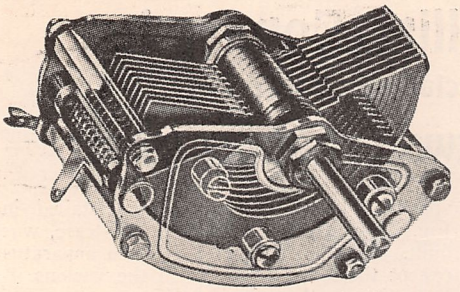
Photo by courtesy of Wheelan Mfg. Co.

the loud-speaker unit is of interest in that the armature is not delicately balanced at the factory, but is left to the user to adjust himself. This operation is a very simple one and is performed merely by the adjusting of a set-screw on the front of the cone.

A TRIPLE CHARACTERISTIC CONDENSER

The condenser illustrated is designed to have straight-line-frequency characteristics from 0 to 50 on a 100-division dial, straight-line-wavelength characteristics from 50 to 80, and straight-line-capacity characteristics from 80 to 100. To accomplish this the rotor plates are semi-circular and the stator plates shaped to give the required capacity variations.

Concentric plate construction permits of the use of pedestal insulation held under pressure, thus preventing warping of the insulation with consequent shift in plate



The special design of the plates of this condenser causes the capacity to vary so that there is an even distribution of stations over the whole scale.

Photo by courtesy of General Instrument Corp.

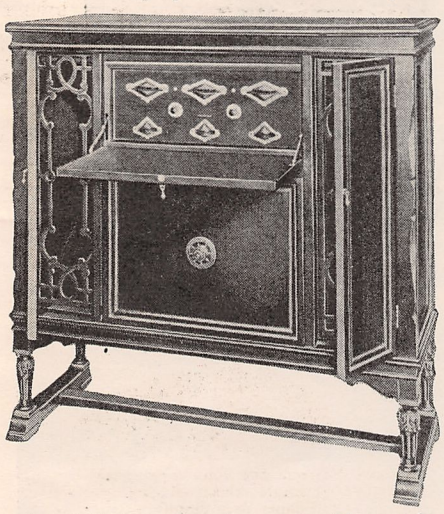
alignment. It also forces the placement of the insulating medium which is illustrated here, out of the active field of the instrument.

Additional features that make for permanency are the inset strip, tobin bronze and ball bearings, rotor and stator plate spacers and supporting members, and solid assembly arms and end plates, incorporated in the instrument shown.

DOUBLE LOUD-SPEAKER CONSOLE RECEIVER

The console receiver has a tuned-radio-frequency circuit, housed in the upper portion of the cabinet. On each side of the console is mounted a loud-speaker. This innovation is employed to get maximum quality of reproduction, one speaker taking care of the high notes and the other giving best results on the lower register. These speakers, being synchronized, are heard as one.

Beneath the receiver itself is a compartment providing space for the necessary bat-



Two built-in loud-speakers make this console receiver one capable of excellent reproduction, as well as a good distance-getter.

Photo by courtesy of A. H. Grebe & Co.

teries. This cabinet comes in several different woods, so that there is no trouble in matching the furniture of the room in which it is desired to place the set.

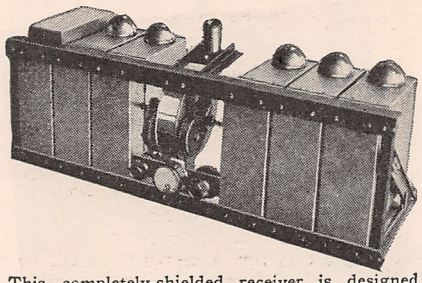
A SINGLE-CONTROL 8-TUBE SET

This neutrodyne receiver, incorporating both Hazeltine and Latour patents, with copper shielding for radio-frequency stages and detector tube, and a steel compartment for audio-frequency stages, is supported on a heavy angle-iron chassis.

This eight-tube receiver may be operated with one hand, through a precision unicontrol mechanism in the form of a bakelite disc, which, by a vernier-gear device, operates a rotary drum bearing a pre-calibrated wavelength scale. This one tuning control takes the place of ten ordinary adjustments and eliminates the necessity of expert knowledge in the operation of such an elaborate type of advanced design in radio apparatus.

Below the wavelength drum is seen the double-range high-resistance voltmeter; and to the left, is the eight-position voltage-control knob, which permits the operator to note instantly "A", "B", and "C" voltages applied to various parts of the circuit.

Above the drum is the holder for the double-winding "neutralized" loop, supplied



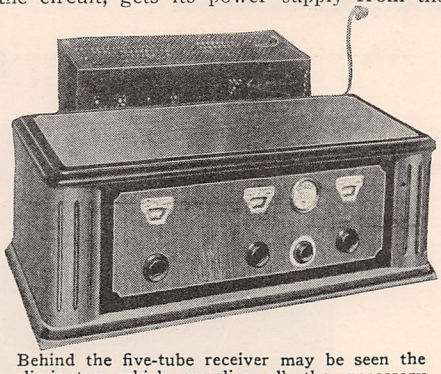
This completely-shielded receiver is designed to operate on a loop antenna which fits in the holder over the tuning drum.

Photo by courtesy of Freed-Eisemann Radio Corp.

with the set. It has sharp directional effect, and does away with the need of an aerial.

A NEUTRODYNE WITH ELIMINATOR UNIT

This loop receiver, having five tubes in the circuit, gets its power supply from the



Behind the five-tube receiver may be seen the eliminator which supplies all the necessary power for it.

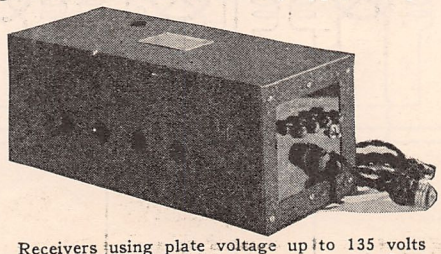
Photo by courtesy of Amrad Corp.

house-lighting circuit. A neutrodyne hook-up is employed, with the conventional two stages of tuned-radio-frequency amplification, detector and two stages of audio-frequency amplification.

Beneath the cabinet housing the set itself is the combined "A, B, and C" eliminator, which operates on 60 cycles, 95 to 125 volts, so that no batteries whatsoever are necessary. Although all the necessary power is derived from the lighting circuit, only 50 watts are consumed, making the cost of running this receiver less than half a cent per hour.

AN ELECTROLYTIC-RECTIFIER "B" UNIT

The "B" Power Unit shown uses four rectifier cells with bridge hook-up, giving full-wave rectification. Two electrolytic condensing cells are used in conjunction with a choke of special design. The use of electrolytic condensers results in a condensing capacity (100-μf.) many times greater than that of the dry type, and pro-



Receivers using plate voltage up to 135 volts can be supplied with the necessary power from this eliminator.

Photo by courtesy of Precision Elec. Mfg. Co.

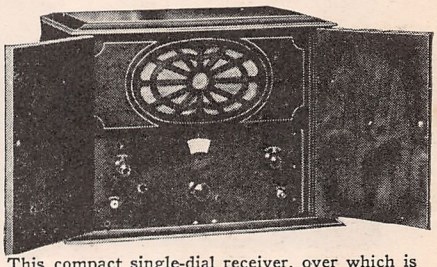
vides a smooth, even flow of D.C. current, uninterrupted by line fluctuations.

The rectifier cells employ aluminum as the rectifying, or film-forming electrode; the anode is composed of a special alloy which does not deteriorate. An electrolyte, which is non-corrosive, permits of practically no voltage loss, so it may be said that the electrical characteristics of the cell are remarkable. All cells are long-lived and instantly replaceable.

Charts show excellent performance curves for this eliminator, the outstanding characteristics being high-milliampere output with low-watt input, making the unit extremely economical to operate.

A 6-TUBE T.R.F. CABINET RECEIVER

It has been said of some radio receivers that the housewife did not like to have them displayed so prominently, because they did not match the furniture in a particular room. The set shown in the accompanying illustra-



This compact single-dial receiver, over which is a built-in loud-speaker, can be completely enclosed by shutting the doors.

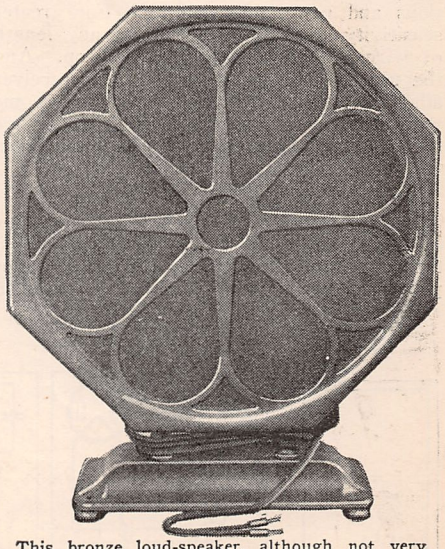
Photo by courtesy of Apex Electrical Mfg. Co.

tion is a compact receiver that will meet the requirements of both partners of the family firm. When the receiver is not being used the doors can be closed, with the appearance of a small cabinet resulting.

In the rear of the wood-finished metal panel is a six-tube T.R.F. receiver, having but one dial for tuning; its readings are seen through the small window in the panel, behind which is a miniature electric light illuminating the dial. Behind the grill-work at the top of the cabinet is a loud-speaker. The circuit is so designed that maximum volume may be had by the use of a power-amplifier tube in the last stage of audio-frequency amplification.

ENCLOSED LOUD-SPEAKER

The octagonal loud-speaker illustrated herewith is a cone of the single-sheet, free-



This bronze loud-speaker, although not very large, gives remarkable reproduction. It is of the single-cone type.

Photo by courtesy of Pausin Engineering Co.

edge type, enclosed in an octagonal case. In the first place the unit of the speaker is securely fastened to the rear wall of the metal casing; and the cone, which is about

(*Continued on page* 612)

A "Superhet" Travelling Companion

A Compact Set Designed Especially for the Traveller

By The Staff of RADIO NEWS LABORATORIES

The Portable Super in operation. Simply open the cover and turn on the filament switch, and it is ready for use —a faithful companion.

HERE is a really compact, lightweight, portable radio set of the superheterodyne type, which uses six 199-type (dry-cell) tubes, and is complete in itself; batteries, loud-speaker, loop and everything are all enclosed within the case. The outside dimensions of the case are 6¼ by 13¼ by 20 inches, and the complete set weighs about 34 pounds. The loop is built into the cover of the case, as shown in the various illustrations, so when the cover is opened, the set is ready for business.

The six dry-cell tubes function as follows: first tube, combined detector and oscillator, connected according to the tropadyne hookup; second and third tubes, two-stage intermediate-frequency amplifier; fourth tube, second detector; and the fifth and sixth tubes are two stages of audio-frequency amplification.

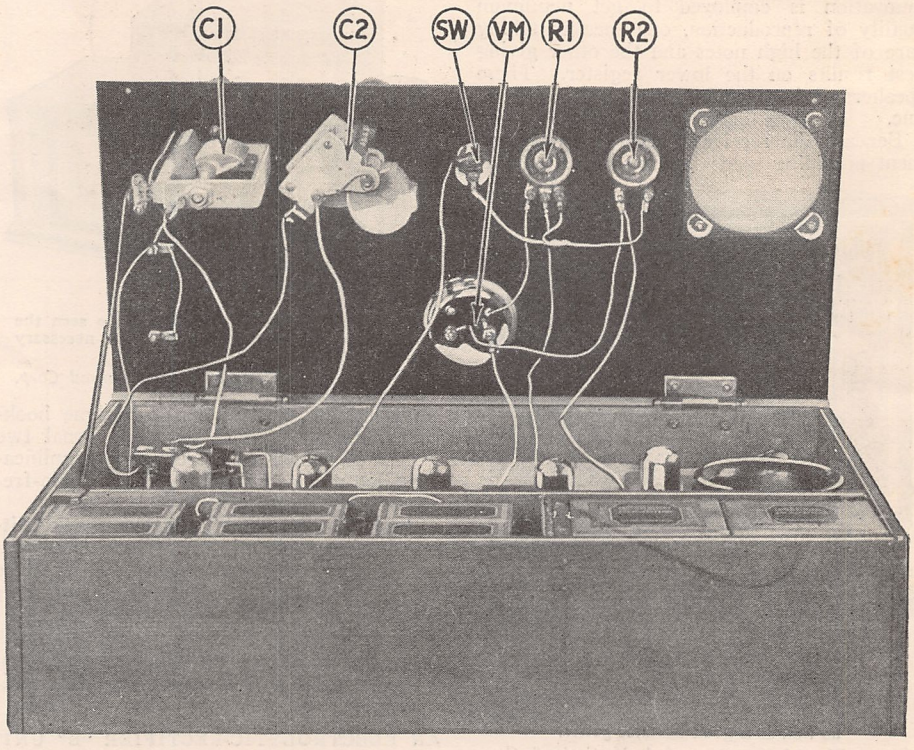
This arrangement proves quite satisfactory, working very well on all local stations and many distant ones. For greater sensitivity an outdoor aerial, of any length of wire, may be coupled to the loop. And the use of UX sockets makes this receiver adaptable for permanent use in the home with 6-volt storage-battery tubes. We have thus a combination that is difficult to beat with any other type of receiver.

ARRANGEMENT OF PARTS

Before building this set a general idea of the space required was formulated, and then a suitable case was purchased; it happened to have the dimensions mentioned above. Then a wooden box, (detailed in Fig. 2) which fitted snugly in the case, was built. This box houses all of the apparatus except the loop, as shown in the various illustrations; the two small compartments hold the "A" and "B" batteries.

For the "A" battery, six 4½-volt "C" battery blocks are connected in parallel. They will give fairly long service and can easily be replaced by removing the battery cover. A 90-volt "B" battery, composed of four 22½-volt small-sized blocks, is employed. The "C" battery is not visible in any of the illustrations, except the wiring diagram (Fig. 1). It is a 4½-volt three-cell flashlight battery, and is mounted on the bottom of the box underneath the loud-speaker.

The small horn-type loud-speaker is mounted on the bottom of the box, as shown. Sponge rubber is used in all places where the speaker is apt to come in contact with the box, to reduce vibration of the tubes, which was found quite annoying in spite of the fact that cushioned sockets were used.



Showing the wooden box, with its hinged bakelite panel, on which all the parts, except the loop, are mounted, removed from the carrying case. The panel is in the open position, with the various parts exposed. The symbols correspond to those in the diagram, Fig. 1.

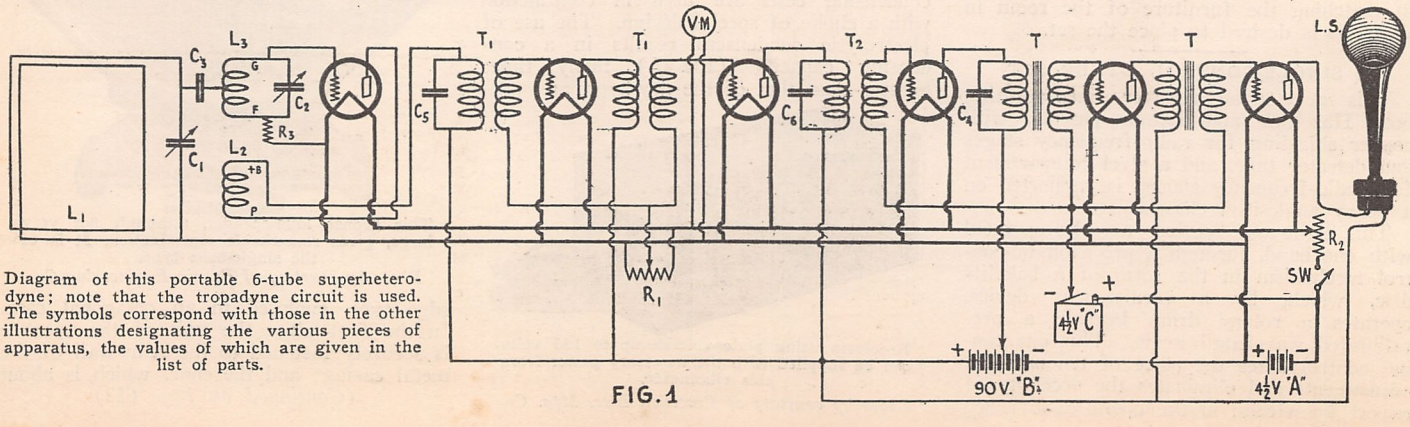
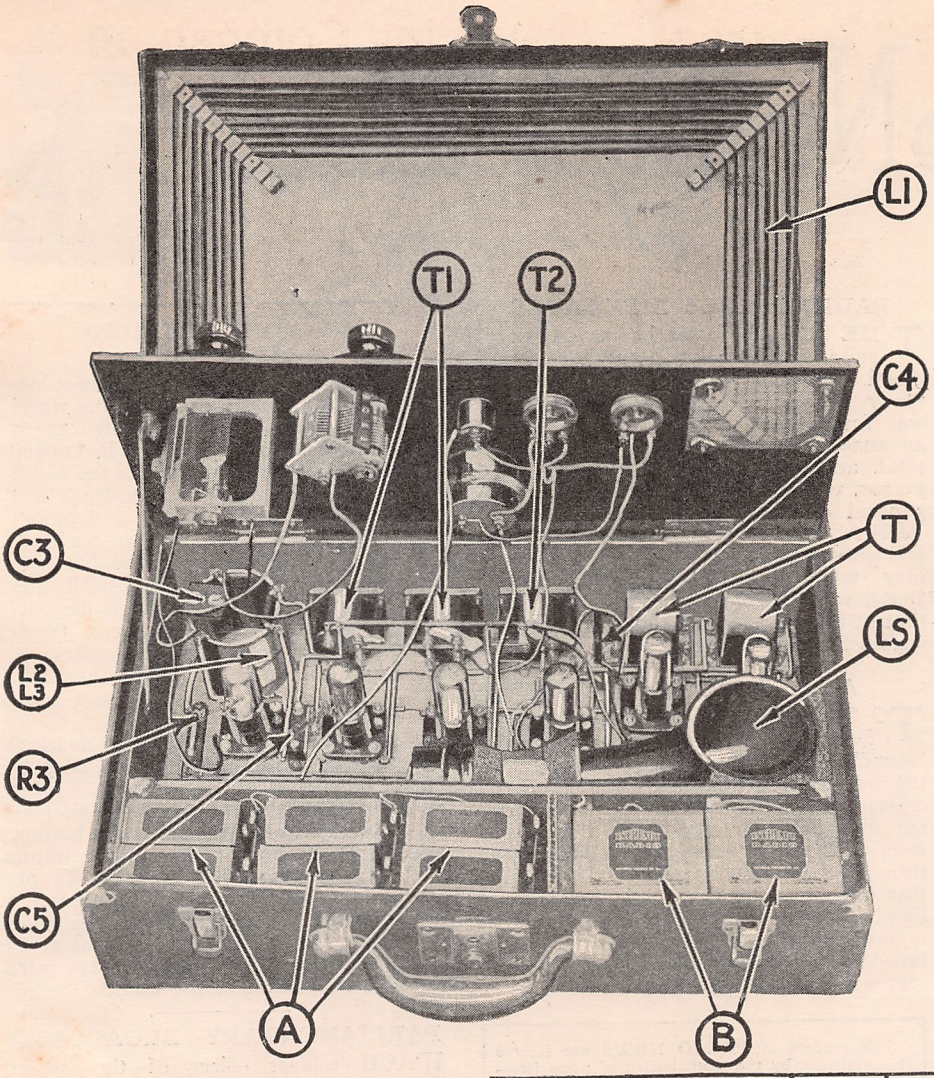


Diagram of this portable 6-tube superheterodyne; note that the tropadyne circuit is used. The symbols correspond with those in the other illustrations designating the various pieces of apparatus, the values of which are given in the list of parts.

FIG. 1



View looking down into the set with the panel in the open position. The wooden cover of the battery compartments is also removed. Note how the loud-speaker is supported on sponge rubber pads to prevent vibration of the tubes.

However, the sponge rubber effectively eliminates all traces of microphonic howl.

The flange of the horn opens, as shown, into an aperture in the bakelite cover; this opening is covered with a copper screen to prevent foreign matter from falling into the horn and damaging the unit.

The panel is 19¼x8¾ inches; on it are

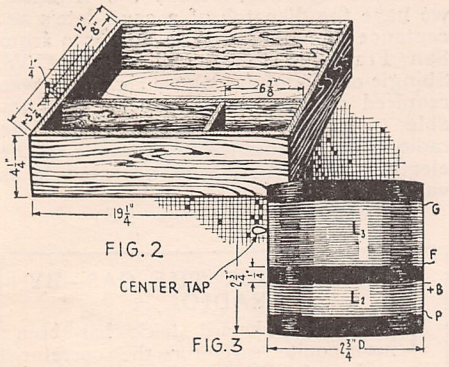


Fig. 2 gives the dimensions of the wooden box employed, which was designed to fit snugly in the carrying case purchased for the purpose. Detail for winding the oscillator coil, L2, L3, (shown in Fig. 3) are given elsewhere on this page.

mounted the tuner and oscillator condensers, C1 and C2, of .0005- and .00037-μf. respectively; the filament switch, SW; potentiometer, R1; rheostat, R2; and voltmeter, VM. The use of a filament voltmeter is recommended; it shows instantly the condition of the dry-cell "A" battery, and is a safeguard against operating the tubes above the normal filament voltage rating.

Flexible wire cables are used to connect the instruments on the panel to those in the box, because the panel is mounted on hinges and the connection must be long enough to allow it to be opened for replacing tubes, etc. The battery compartments have a wooden cover, 19¼x3¼ inches.

In the box are mounted the six sockets, oscillator coupler, intermediate and audio transformers, fixed condensers, grid leaks, etc. The construction of the oscillator coupler is shown in Fig. 3. The winding L2 consists of 35 turns of No. 26 silk covered wire; and the winding L3 has 50 turns of the same wire, wound in the same direction and spaced ¼ inch from L2. A center tap is provided on L3.

EFFECT OF METAL IN CARRYING CASE

The loop consists of 16 turns, wound in two layers on the wooden supports as shown, one layer on each side of the supports, which are attached to the cover of the carrying case. In the carrying case we selected, a metal flange extended completely around the rim of the cover, forming a short-circuited metallic turn closely coupled to the loop. This almost killed reception entirely, but its effect was eliminated by sawing a small portion, about ¼ inch, out of the metal rim, thus opening the circuit. The loop now works efficiently.

Fig. 1 is a diagram showing all connections; there is nothing unusual about it to require any special comment. The values of the apparatus are given in the list of parts. The two intermediate transformers T1 are of the broadly-tuned type, and that marked T2 is of the sharply-tuned "filter" type. A "C" battery is used on the second detector instead of the conventional grid condenser and grid leak. The by-pass condenser C5 is of the small ("midget") type; it should

(*Continued on page* 522)

SYMBOL	QUANTITY	NAME OF PART	VALUE OF PART	REMARKS	MANUFACTURER*	
C1	1	Variable Cond.	.0005 Mf.	Tuner	1	2,11,15,16,17,23
C2	1	Variable Cond.	.00037 Mf.	Oscillator	2	1,10,11,14,15,16,17,23
SW	1	Filament Switch	S.P.		3	25,19
R1	1	Potentiometer		For intermediate amp.	4	14,19,23,27
R2	1	Rheostat	10 ohms	For all filaments	4	19,23,27
VM	1	Voltmeter	0-5 V.	For filaments	5	20,21,22
L1	1	Loop	80ft.	Home made		
L2-L3	1	Oscillator coil		Home made		
C3	1	Grid condenser	.0005 Mf.	First Detector	6	24,17
R3	1	Grid leak	1 meg.	First detector	7	23,6,8
T	2	Audio trans.			8	18
LS	1	Loud Speaker			9	28,29,31
T1	2	I.F.T.			10	
T2	1	I.F.T.		Filter	10	
C4	1	Fixed Condenser	.005 Mf.	Bypass	6	24
C5	1	Condenser	.00005 Mf.	Bypass	11	24,32
C6	1	Condenser	special	Furnished with T2	10	
	2	Dials	Vernier		12	8,11,14,30
	2	Binding Posts		For loop	13	26,33,14,6
	1	carrying case				
	1	frame		Home made		

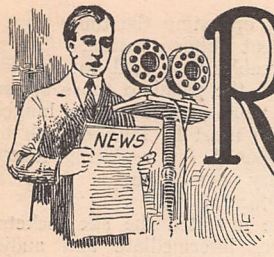
NUMBERS IN LAST COLUMN REFER TO CODE NUMBERS BELOW.

1 Samson Elec. Co.	13 American Radio Hdw. Co.	25 Yaxley Mfg. Co.	37
2 Radio Cond. Co.	14 General Radio Co.	26 X-L Radio Labs.	38
3 Saturn Mfg. & Sales Co	15 General Instr. Corp.	27 Allen Bradley Co.	39
4 Cartar Radio Co.	16 Hammarlund Mfg. Co.	28 Duro Metal Products	40
5 Weston Elec. Inst. Co.	17 Pilot Elec. Mfg. Co.	29 Spartan Elec. Corp.	41
6 Aerovox Wireless Corp.	18 Karas Elec. Co.	30 National Co., Inc.	42
7 Daven Radio Corp.	19 Cutler-Hammar Mfg. Co.	31 Tower Mfg. Corp.	43
8 Pacent Elec. Co.	20 Sterling Mfg. Co.	32 Electrad, Inc.	44
9 Nathanial Baldwin	21 Burton Rogers Co.,	33 Kellog Sw. & Sw.	45
10 Silver-Marshall, Inc.	22 Jewell Elec. Instr.	34	46
11 Bremer-Tully Mfg. Co.	23 DeJur Products Co.	35	47
12 Martin Copeland Co.	24 Dubilier Cond & Radio	36	48

APPROXIMATE COST OF PARTS $45.00.

* THE FIGURES IN THE FIRST COLUMN OF MANUFACTURERS INDICATE THE MAKERS OF THE PARTS USED IN THE ORIGINAL EQUIPMENT DESCRIBED HERE.

Form Copyright E. P. Co., 1926.



Radio News of the Month

TRANSATLANTIC BROADCASTS

REMARKABLY good reception of American stations in the early morning hours is now reported from England, signals coming in strong as soon as darkness falls on the transmitter. Arrangements have been made by David Sarnoff, of the R.C.A., for programs by the B. B. C. this fall for the benefit of American listeners. As England is five hours ahead of our Atlantic coast in time, these are given between 2 and 7 a. m. in London, so that American B. C. Ls. may have night reception at convenient hours.

NEW FOREIGN STATIONS

AMONG broadcast transmitter installations announced recently as completed or to be in operation soon are: Basel (Bâle) Switzerland; Montevideo, Uruguay; AYRE, Caracas, Venezuela (1,000 watts, 375 meters); Leipsig, Germany, (9-kw, 452 meters); CYC, Vera Cruz, Mexico (337 meters); Sao Paulo, Brazil. Large additions to the number of Danish stations are expected. At present there are over thirty new European stations projected, and a conference at Geneva to redistribute wavelengths assumes importance.

BEACONS FOR AIR PILOTS

THE Department of Commerce is arranging for the installation of 50 radio beacons and 95 communication stations for the use of aviators on the 9457 miles of airways now in use. No point on a route will be more than a hundred miles from any signal station. Both sight and sound controls (as described in RADIO NEWS for March and July, 1926) will make the airman's course as plain as a city street. One-kw. transmitters will be used, on 1034 meters for the course signals, and about 550 meters for weather reports and other communications to the planes.

RADIO FOR EVERY BED

AT Grasslands Hospital, East View (near New York) a $5,000 radio installation has just been put in operation. Individual headphones are provided for the bed of every patient. The funds were raised by a committee of residents near the hospital; and about thirty patients enjoyed the opening ceremonies and programs.

WEATHER MAPS BY RADIO

A RADIO-MAP machine, operating on the Jenkins picture-transmission system, is now in use broadcasting daily weather charts from Station NAA, Arlington, Va., on 8000 meters. Tests carried out in connection with the ships *Trenton* and *Kittery* have so far been quite successful. The Shipping Board and the Weather Bureau are co-operating with the navy in arranging for these experiments. Ultimately it is hoped that this system may become of such general use that the public can obtain individual weather maps by broadcast reception.

RADIO BRINGS LIFE-SAVER

THE SOS of the sea has saved thousands of lives; but a call for human blood broadcast recently found equally ready response. A blood transfusion was found necessary to save the life of an anaemic woman in a Richmond hospital, and no source was available of a person whose "reaction" was similar. A general call was sent out over station WRVA, and responses were numerous and immediate. One volunteer of over fifty who replied in person, Manley Betts, was discovered to have blood like that of the patient, and the operation was successfully performed.

A RADIO "SOUNDHOUSE"

TO Calais, France, belongs the distinction of having the first crystal-controlled "soundhouse," says *Popular Wireless*. At the end of the sea-wall is a vibrating quartz-crystal and vacuum-tube device, which sends out an under-water sound-beam that can be received by ships better than a light beam, through fog, blizzards, etc. It is possible that these soundhouses will in time replace lighthouses altogether. The one at Calais is a near relative of the crystal-controlled broadcast transmitter, and it is another instance of radio helping its sister-sciences.

The readers of RADIO NEWS are invited to co-operate by the contribution of news items which concern novelties in radio or in the uses to which it may be put; especially those in which the element of human interest is found. They should be short; for each one published $1.00 will be paid. Address News Editor, RADIO NEWS, 53 Park Place, New York City.

COMMUNAL RADIO INSTALLATIONS

THE Soviet Government of Russia, following its persistent policy of general education and national propaganda, is equipping every village and hamlet in its dominions with a central receiving set, whereby the programs of the government stations may be received en masse by the population, according to the reports of recent travellers.

THE "HUE AND CRY" BY RADIO

THE prefecture (headquarters) of police at Paris has been equipped with the Belin apparatus, by which facsimiles of the fingerprints of criminals can be sent out almost instantaneously to the other leading cities of France when their possessors are wanted. It is hoped to make such an arrangement international in its scope.

A HURRICANE-WARNING STATION

THE coast of China has been from time immemorial exposed to the ravages of typhoons, or tornadoes of extreme violence, from the south. A new station of enormous power has been erected at Praya, an island 80 miles south of Hong Kong, from which it is hoped to detect the approach of storms (by the atmospherics produced) and send out timely warnings to the mainland.

DIAMOND-STUDDED RECEPTION!

WHAT is said to be the most expensive radio receiver in the world was a present to Miss Jean McLean of San Francisco at her wedding in London to Capt. Howard Sanderson of the Welsh Guards. It is about 4 inches by 6, and 3 inches high, designed as a dressing-table ornament; but it also perfectly works a loud-speaker if desired. Twenty-seven large diamonds and 105 small ones are studded in filigree gold on the outside case, as well as a number of emeralds, rubies, aquamarines and agates.

ELASTIC TUBES?

AMONG the exhibits at the National Radio Exhibition, London, says the News of the World, is a picture which operates as an excellent loud-speaker and tubes which may be dropped, bounced and knocked about with seeming impunity. If the promoters are able to persuade some enterprising manufacturer to show a tube which will stand the shock of putting the "B" battery current across the filament, they will indeed, have introduced a real boon to the novice.

PARLIAMENTARY BROADCASTS

EACH cabinet officer of the German government has been supplied with a radio set for his offices, by which he can follow the proceedings of the Reichstag without leaving his desk. As, under the European administrative system, the presence of administrative ministers is frequently required in parliaments, this will prove a great time-saver. The League of Nations has been recently broadcasting its procedings by land-lines from Geneva.

RADIO SIGNATURES LAWFUL

FOLLOWING the transmission of a check by radio across the Atlantic, we have the dispatch of a candidate's acceptance of nomination to an office from San Francisco to Hawaii. Robert W. Shingle of Honolulu, whose signature was required on the official papers, was unable to reach his home in time. He radioed his acceptance in facsimile to the election authorities, who accepted it as valid.

(*Continued on page* 585)

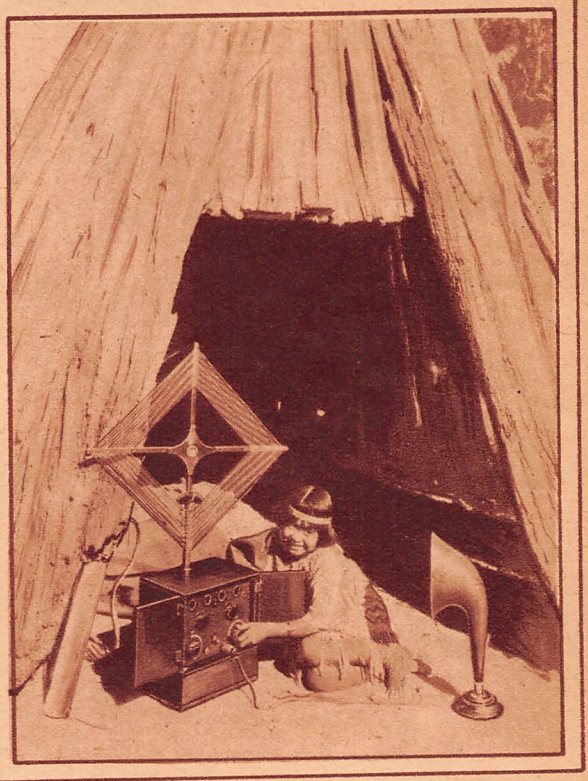
BLOWING OUT THE GAS—BY RADIO

THIS old-fashioned trick has been made quite safe for the operator, as evidenced a few days ago at San Francisco, when a demonstration was made before University of California students. Charles Kellogg, a singer of exceedingly high-pitched voice, broadcast a sustained note; and at twelve miles the reproduction of the sound from the loud-speaker extinguished a gas jet, set so that the flame would respond by vibrations to the exact tone sounded. The principle has long been known in physics, but never before been demonstrated by radio.

Round the World With Radio

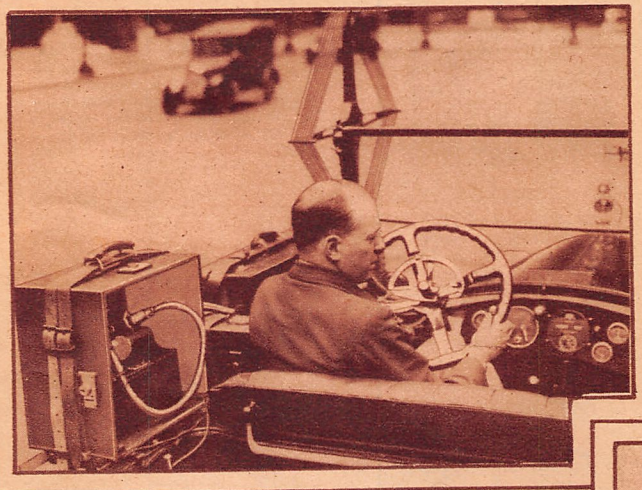
RECEIVING, TRANSMITTING AND RECORDING FROM AN AUTOMOBILE

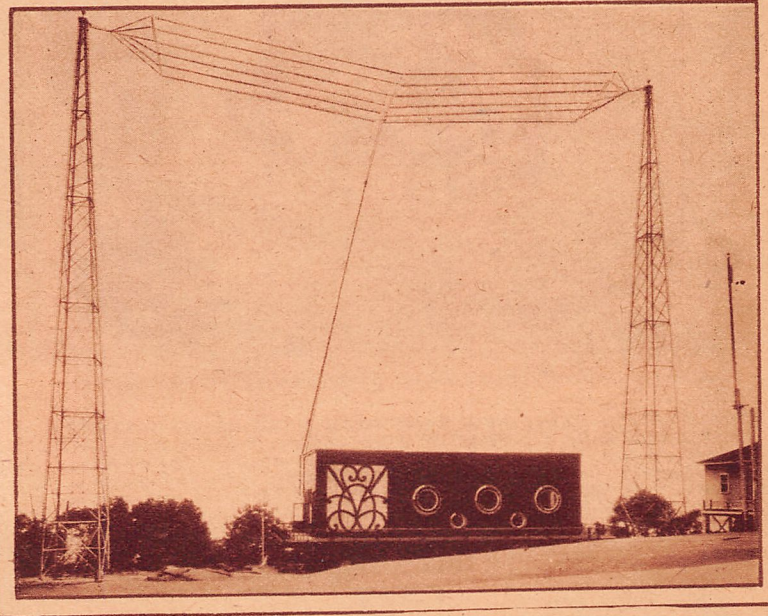
Capt. Plugge, world-traveller and radio expert, is travelling from London to Constantinople in a car fitted up with a 50-watt transmitter, a generator, and a nine-tube receiver. The trip was scheduled for a month's time, crossing fifteen European countries en route, and having an itinerary of 5,000 miles. During the period experimental broadcasts will be carried out, the car being equipped with a microphone for phone transmission. In the picture above, Capt Plugge is shown making a record of his experiences on a dictaphone, which he will use to keep his diary and run off at the end of his trip. The loud-speaker of the set is shown at the left. Below is shown the loop antenna in position. © Herbert Photos, Inc.



LO THE POOR INDIAN LISTENS IN ON THE EVENING PROGRAM

Princess Little Bluebird, of the Yosemite Indians, is shown tuning in her favorite jazz band number on her radio set outside the wigwam. The white man's radio is one of his innovations which meets with the thorough approval of the red brothers and sisters. © Wide World Photos.





THIS MONSTER RECEIVER MAY FOOL YOU—IT TRANSMITS!

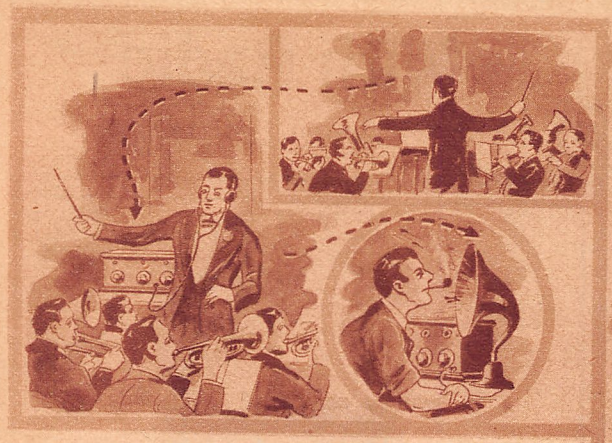
The latest model in broadcast studios is perched on the top of the Palisades at Cliffside, N. J., opposite upper New York City. The transmitter of station WPAP, located at Palisades Amusement Park, is made in the shape of a greatly-magnified receiving set.

TWO LITTLE MAIDS FROM A JAPANESE SCHOOL

This scene is laid in a garden at Tokyo. The ladies are listening in through crystal sets whose detectors are concealed in the handles of their parasols, the frames serving as aerials. © Herbert Photos.

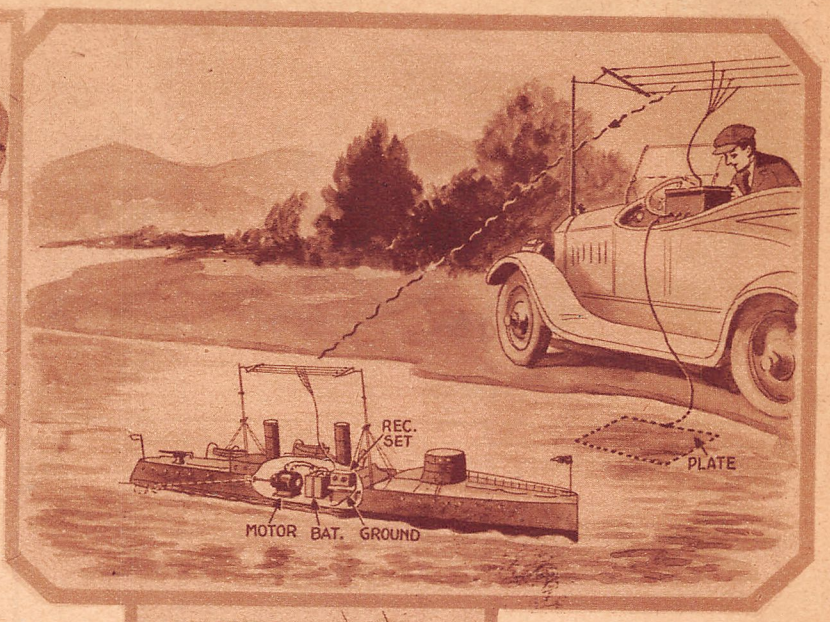
Radio News of the Month Illustrated

By GEORGE WALL



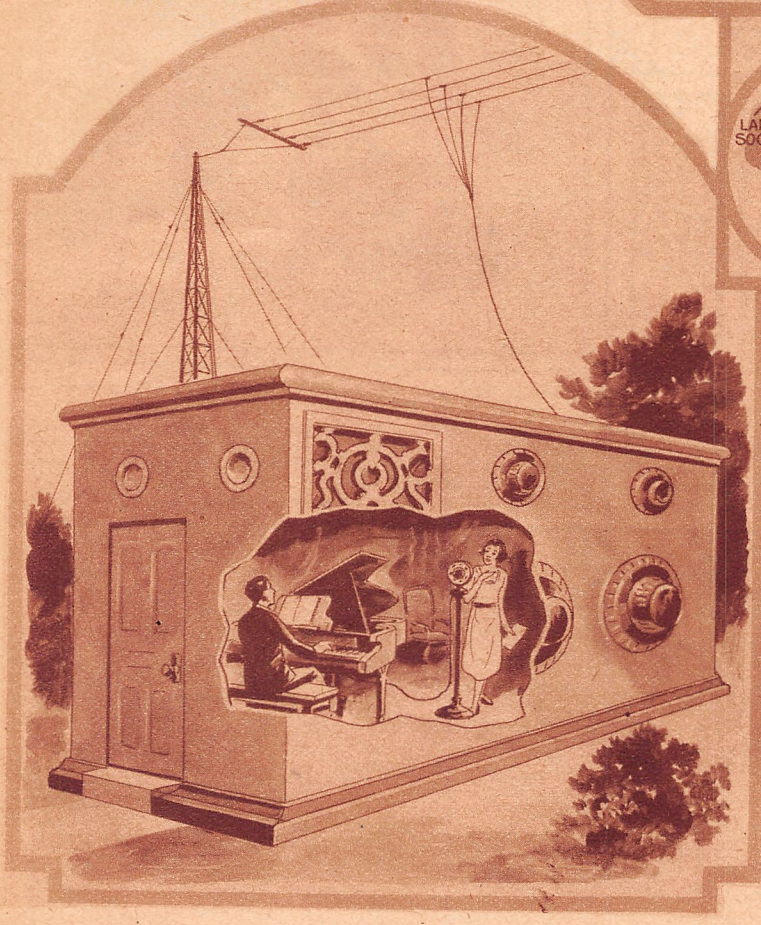
A "DISSOLVING" RADIO PROGRAM EFFECT

Everyone knows how a stereopticon view is caused to "dissolve" into another by putting in the second slide before withdrawing the first. The stunt illustrated above is in some respects similar; while one orchestra was playing, another was brought into synchronism with it, and the two were broadcast simultaneously. Number one was then slowly "turned out," and number two orchestra finished the number.



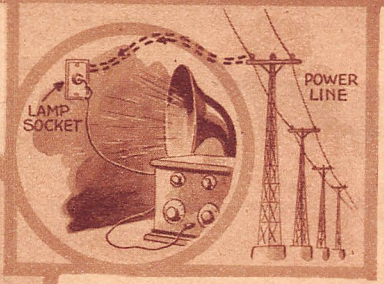
A BOY'S RADIO BOAT

Burt E. Moritz, Jr., a 17-year-old radio enthusiast of Denver, has been demonstrating his radio-controlled boat on the lake in the city's park. The boat is controlled by a transmitter in the car on the bank. The little boat is "grounded" to the water, while its antenna gathers in the radio signals.



BROADCASTING RADIO PROGRAMS FROM A BIG RADIO CABINET

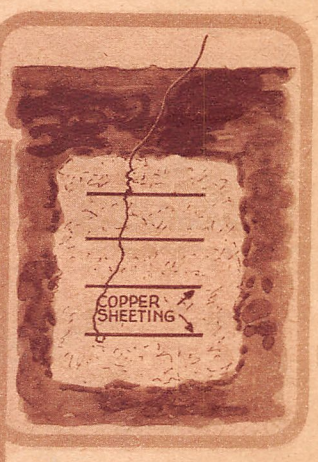
This illustration shows a cross-section of the studio at Palisades Amusement Park opposite New York City, the exterior of which appears on the preceding page. The end of the building which has the appearance of the loud-speaker is, as may be seen, the studio of the station; while the mechanical equipment is housed at the end which bears the big "tuning dials."



"WIRED RADIO" SERVICE

Wired radio reception is to be furnished fans at Rochester, N. Y., by a public utility company. Its customers will plug into the light sockets to obtain their programs. With super-power, we may soon have super-radio.

DX hounding is fascinating, but midnight is the legal curfew hour for loud-speaker reception, even in night-living New York, according to the decision of the courts. After that time only headphones should be used.



UNDERGROUND RECEPTION WINS LISTENING CHAMPIONSHIP

Fans seeking better reception should take a leaf from the book of this year's "Radio Queen," who has eight antennae. One is an underground system, composed as shown of copper plates buried in a trench, in a mixture of old newspapers and brine.

"GENTLEMEN OF THE JURY"

In a western city jurors will be entertained with radio programs after working hours, the court having permitted it. However, should the case figure in the news reports, a bailiff will censor allusions to the trial by turning off the set.

THE RADIO CHIMNEY SWEEP

Electricity can be used to keep chimneys free of soot. However, the latest suggested procedure of disposing of old dry cells is not electrical, but chemical. Thrown into the furnace, the zinc volatilizes and the action of the liberated fumes cleans the chimney and may forestall a visit from the fire department. Try it some time, when you put in new batteries.

"Came The Dawn" (A Scenario)

Radio Rescues Ravishing Rita

By C. STERLING GLEASON

IT is with tears of anguish that we relinquish this supreme but illegitimate masterpiece—and place it before the eyes of a too innocent world. We wanted to keep it to ourselves. However, the spirit of altruism has overtaken us and we see now, only too clearly, that it would be the lowest of selfishness to keep in hiding the almost breath-taking disclosures, which the author has made relative to the science of radio.

Tragedy and dark laughter lurk between the lines; the art of radio is delineated as it has never been portrayed before. The whole darn yarn is tremendous from beginning to end. We swallow our remorse—or our conscience—and hand it to you, straight from the shoulder. May The Dawn come to you as it came to us—bless you, gentle reader.

CAME the dawn, in all its radiant splendor, tipping the broad swells of the deep Pacific with silver. Through the heavy overhanging clouds it shot a rosy ray; it lightened the overcast sky with the promise of a new day, and awakened the little twittering seagulls to a joyful paean of gladness. And at desolate Tapioca Island, it sent one penetrating gleam through the window of the little cabin where beautiful Rita Romanoff sat in the depths of utter despair.

Small wonder the brave heart of lovely Rita was downcast; after so many hair-breadth escapes before the camera from Dandy Diavolo, that peerlessly wicked star of the Flicker Film Corporation, Incorporated, whose sneer is known in every corner picture palace from Topeka to Timbuctoo—she had in real life fallen prey to the machinations of this double-dyed, fast-color villain. To a fate worse than death, she had been lured into the rocky fastnesses of Tapioca; and now no flickering Kliegs to alleviate the terrors, but everywhere the starkness of dead reality.

Before the hearth sat beautiful Rita, almost crushed by the ruthless blow Fate had dealt her, but still borne up by that courageous heart, which alone had sustained her through so many hair-raising adventures; most recently during the tense hours of imprisonment in the empty vats of an Eastwing bootleggery, when every moment her life was in danger of being snuffed out by a new distillation, and whence she was rescued just in the nick of time by Harold Dare, who, strangely enough, happened to be cast for the role of Federal bootleg inspector.

The grilling night following her swift abduction from the very threshold of her palatial Hollywood mansion had so wrought upon her harassed spirit that a moment before, overcome by the hard horribility of it all, she had been ready to break down, to burst into tears, and completely surrender herself to her cruel fate. But now, as the little questing ray of light shot through the windowpane, a thrill of hope revived the desperate maiden, and the glow above the treetops seemed the promise of a brighter day.

In the corner of the room stood Dandy Diavolo himself, twirling the dial of a Mosby K9 receiver presented to him by some admirer who believed in showing appreciation in a manner more substantial than the usual request for an autographed photo. As originally presented, the set had included a full complement of Genutrons; but, with his usual selfish disregard for sentiment, Dandy had substituted in the detector socket a specially-built Czechseal tube. Every radio fan knew about the famous tube, thanks to the efforts of Dandy's indefatigable press agent and Czechseal's advertising department. It was built to order, with a characteristic curve sloping like Mont Blanc, and steeper than the salary paid Dandy each week by Flicker Film Corporation, Inc.

For the benefit of the technically-inclined reader, we shall introduce at this time some of the most striking points in the developing of this famous detector tube by Czechseal; thus lending technical color and plausibility, beside enhancing editorial favor. Czechseal engineers designed the tube to give a sensitivity roughly 327½% greater than the standard NG-200 or 1Q-301A This was accomplished by drawing a hy-

(*Continued on page* 536)

"—he is no match for courageous Harold Dare. In a trice the villain is tightly trussed."

What Music Means

By CHARLES D. ISAACSON, Program Director, WRNY

RADIO broadcasting consists of music to so great a degree that it may not be amiss if I try to give you a little of the beautiful vision I have of the immortal and angelic art.

Of course, radio has changed the opinions of millions about music—by just bringing it into homes where it was formerly unknown. People who wouldn't take the trouble to go to a concert or opera, took a little taste, by accident, or in an adventurous spirit—and found that it wasn't so bad!

That clever gentleman, George Jean Nathan, in his "House of Satan," says that radio has helped to drag down American taste, by distributing poor music. As a matter of fact, Mr. Nathan, if he had really made any careful observations at all, would have found that more people have had an introduction to good and broadening things through the radio, than have ever been hurt by it. I have yet to meet an individual who ever went with pleasure from fine uplifting drama or excellent music to the "cheap" things.

The history of the world is that of its gradual moving upwards toward better standards. Radio has, it is true, broadcast much of jazz and ragtime and stupid, banal, worthless music. But it has also sent into countless homes so much that is of the better type.

You have all heard about the gentleman who when asked about the opera, said that it was a place to sleep in, and that they charged you so much, but you couldn't sleep anyway because they made so much noise. Art has been looked upon as "highbrow," and good things called uninteresting.

I never want a human being to desire good things only because it's "the thing to do"—there's too much faddishness and affectation in life as it is. True, many make a society function of music; but the people who have stood for hours in sleet, snow and rain, to get standing-room at the opera house, know why they need something which only beauty can bring into their lives.

I always insist that if you can't get as much of a kick out of opera concerts or art exhibits as you do out of a movie or a baseball game, you had better stay home! But you can get more; more of something else. What is that something else? It is something, which is hard to tell about, hard

(*Continued on page* 552)

Jean Lowell
Who is often heard at WRNY, appeared last year in "Port of London" and will star on Broadway this season.

John Barnes Wells
Favorite tenor of radio land, whose solos were an enjoyable Edison Hour feature of late at WRNY.

Georgette Nyrielle
Soprano, and French leader at WRNY, who presented the big aviation cake to Capt. René Fonck.

Renee Schieber
Soprano soloist at New York City's famous synagogue, Temple Emanu-El, and a regular at WRNY.

Ragani Devi
Who with her tambura and sitar has brought the Orient from the Vale of Cashmere to WRNY for an Eastern Night's wizardry.

Alfred Hall
Introducing in person WRNY's affable announcer, with whom you already feel an established acquaintance.

Yugi Hirose
He broadcast Japanese melodies from WRNY. His father was the first native Christian minister in Japan.

Vincent Ballaster
Baritone, and headliner of the Metropolitan and Chicago Operas, has been an Edison Hour soloist lately at WRNY.

A Hawaiian Number at WRNY
The spirit of the farthest Occident is reproduced in Betty Marvyn's music.

Dr. Bernard Katzenstein
Is WRNY's dental authority. He broadcasts hygienic advice on the care of your mouth.

Virginia Moreno
Comes from Georgia, which, as you already know, is famous for raising peaches. One of WRNY's finest sopranos.

David Putterman
Not only the youngest cantor of American birth, but one of the finest. He is often heard over WRNY.

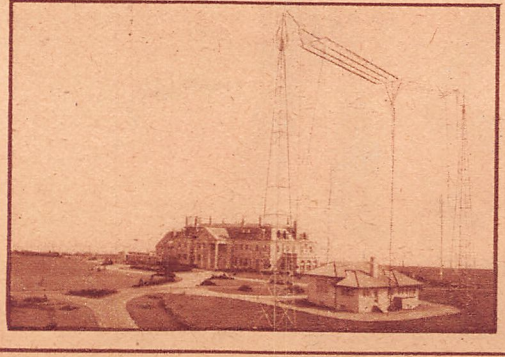
Hon. F. H. LaGuardia
New York's eloquent and aggressive congressman, is a regular WRNY speaker, and well worth hearing.

Neville Brush
Is often heard in dramatic readings at WRNY. Here he is gazing upon the famous Raven in his thoughts.

Josefa Chekova
Who brings the spirit of old Bohemia (not the Greenwich Village kind) to WRNY in her songs.

Maya De Cortez
She has been a star in Italy and America. She is now a star at WRNY and figures frequently on its program.

Station WMAF, Dartmouth, Mass.
Col. E. H. R. Green's big station, which rebroadcasts WRNY programs each Tuesday and Thursday



The "Pianorad"

A New Musical Instrument Which Combines Piano and Radio Principles

By HUGO GERNSBACK

THIS year marks the second centenary of the creation of the piano. There has been no radical development in the piano since except the advent of the player piano or mechanical piano.

The Pianorad, which is played very much like the piano, by means of a similar keyboard, is a new invention. In this new musical instrument, the principles of the piano as well as the principles of radio are for the first time combined in a single musical instrument.

The Pianorad was first demonstrated on Saturday, June 12, during the celebration of Station WRNY's first anniversary, when it was used to broadcast its music.

The Pianorad is the invention of Mr. Gernsback, and was built in the RADIO NEWS LABORATORIES by Mr. Clyde J. Fitch.

This is the first time that a musical instrument has been constructed from radio parts; and it should therefore have more than passing attention from all radio interests.

THEORY OF THE INSTRUMENT

The Pianorad has a keyboard like an ordinary piano, and there is a radio vacuum tube for each one of the piano keys. Every time a key is depressed, there is energized a radio-oscillator circuit which gives rise to a pure, flutelike note through the loud-speaker connected to the device. It is possible to connect any number of loud-speakers to the Pianorad if it is desired to flood an auditorium with its tones. Also, by arranging suitable outlets for loud-speakers on different floors or different rooms, the sounds of the Pianorad can be heard all over any large building.

The musical notes produced by vacuum tubes in this manner *have practically no overtones.* For this reason the music produced by the Pianorad is of an exquisite *pureness* of tone not realized in any other musical instrument. The quality is better than that of the flute and much purer. The sound, however, does not resemble that of any known musical instrument, the notes are quite sharp and distinct, and the the Pianorad can be readily distinguished by its music from any other musical instrument in existence. In the Pianorad one vacuum tube for each key is connected electrically with certain coils (inductances). Any number of notes can be played simultaneously, as on the piano or organ; unlike the piano, however, the notes can be sustained for any length of time. On the ordinary piano you strike the key and the sound quickly dies away, in the Pianorad, the sound remains as long as the keys are depressed.

The Pianorad, showing the twenty-five tubes and oscillator circuits.

ELECTRIC, NOT SOUND WAVES

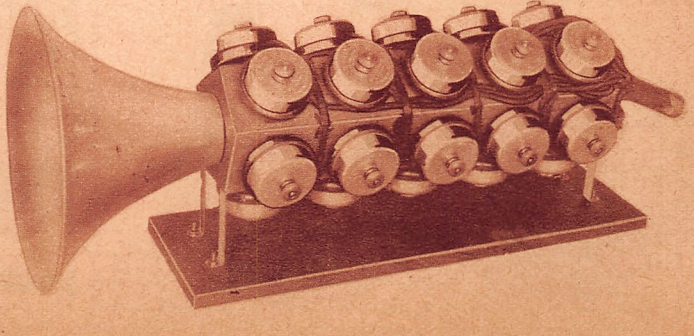
The loud-speaker arrangement makes it possible for an artist to play the keyboard while the music emerges, perhaps miles away from the Pianorad. It is thus possible for the pianist to play the instrument in absolute silence while the music is produced at a distance. This requires simply that a wire line must connect the output end of the Pianorad instrument with the loud-speaker at some distance away. It is quite feasible for the Pianorad to be played in New York while the music will be heard at the Chicago end, with any number of loud-speakers connected by amplifiers to a long-distance telephone wire line.

A novel idea is the connection of the Pianorad *direct* to the broadcast-station transmitter. In this case, instead of using a loud-speaker in the studio, the Pianorad is connected electrically to the broadcast transmitter. The artist now plays the Pianorad in the studio in absolute silence. No sound is heard. The radio audience, however, will enjoy the music, although no one in the studio can hear it. In order that the pianist may hear what he is playing, he will wear a set of head receivers attached to an ordinary radio set. The music, therefore, is picked out from the air by the receiver and thus only the artist hears it. In the studio itself, however, no sound is audible, for the Pianorad itself is silent.

DEVELOPMENTS STILL CONTINUING

The Pianorad has as yet not entered the commercial stage. The instrument illustrated in this article has 25 keys and therefore, 25 notes. A full 88-note Pianorad has as yet not been constructed, but will be built in a short time. The larger instrument could have been built at once, but it would occupy almost as much space as a piano;

(*Continued on page* 603)



Above is shown the Pianorad as operated in WRNY studio; at the right is the loud-speaker horn with its twenty-five units separately connected for eliminating harmonics.

Push the button and in comes your radio station! Ada Winston says that this is the simplest way to tune-in.
© Underwood and Underwood.

Ethel Jackson tunes-in on the radio receiver in the first floor of the little "Listen Inn." The second floor is occupied by the loud-speaker for the set.
© Wide World Photo.

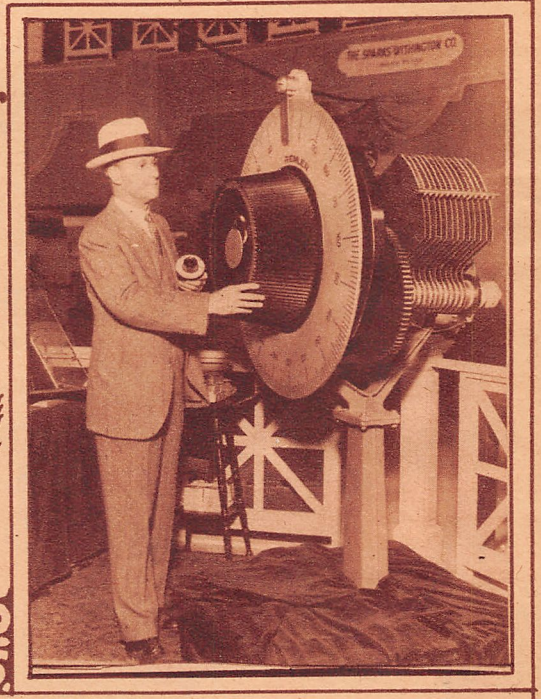
The Third Annual Radio World's Fair

THE products of over three hundred radio manufacturers were on display at the Third Annual Radio World's Fair held in the new Madison Square Garden, New York City, the week beginning September 13. All of the 30,000 square feet of available space was taken up by the multitude of booths.

The major portion of the set manufacturers' exhibits were located in the immense basement of the new structure; the arena and balcony promenade held those of parts manufacturers and the temporary broadcast studios erected for the occasion. The total expenditure for instituting and preparing the exposition considerably exceeded $150,000.

INDICATION OF STABILITY

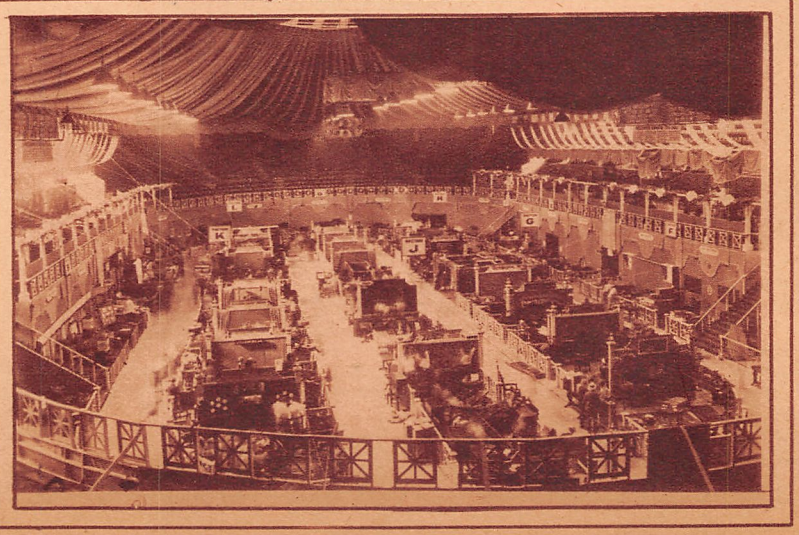
Opinions voiced by the majority of exhibitors and visitors are to the effect that the



Tex Rickard tunes the world's largest variable condenser. Notice the difference between the size of the one in his hand and that of the one he is tuning.
© Wide World.

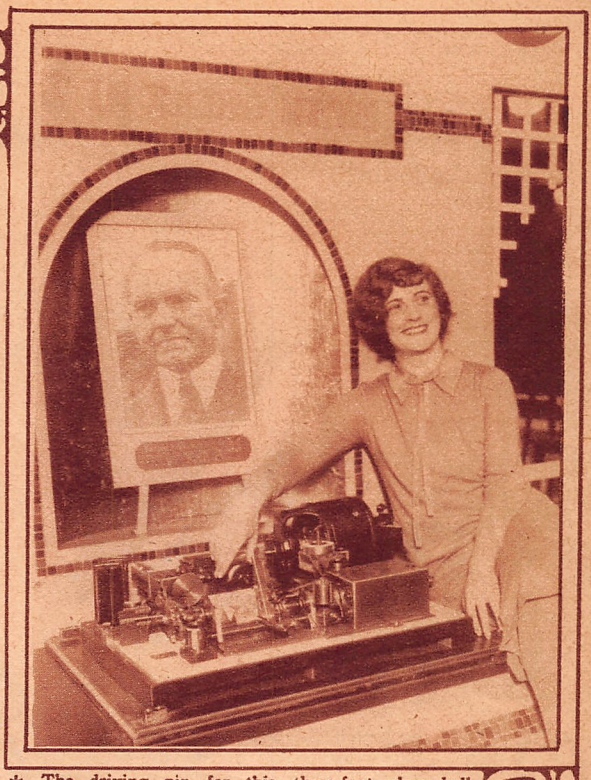
Below at the right is a view of the Arena Floor of Madison Square Garden, New York City, where the biggest and best radio world's fair was held. Exhibits may also be seen in great numbers on the balcony; and there were just as many in the basement.
© Herbert Photos, Inc.

The one-meter transmitter below at the left operates on 110 volts, A.C. The two square plates form the condenser which is set exactly for the proper wavelength. The vacuum tube, with its base removed, is enclosed in a metal shield. © Herbert Photos, Inc.

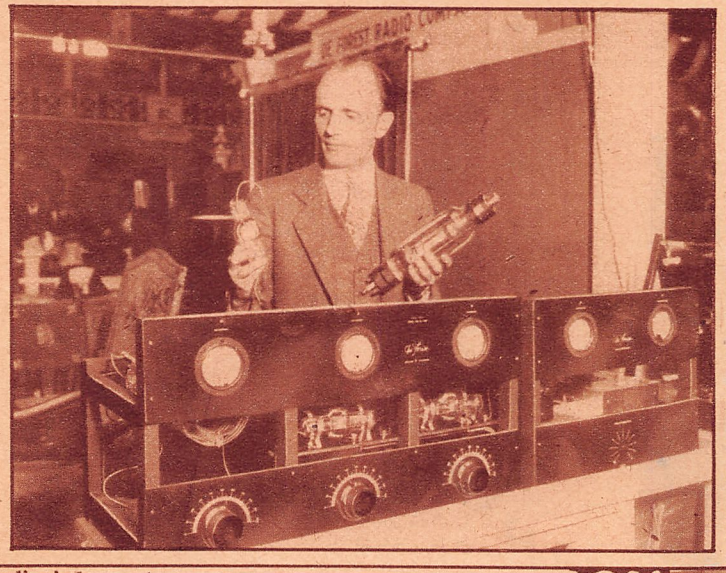


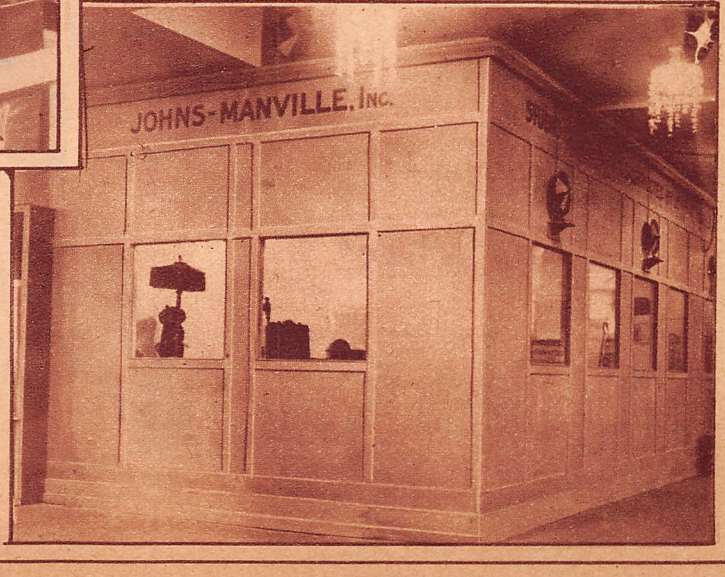
At the right is shown an instrument for the reception of photographs by radio and above it is shown a portrait of President Coolidge. This picture is an enlargement of the one shown on the receiving drum of the receiver under Miss Harriet E. Summers' hand.
© Herbert Photos, Inc.

In the illustration below is shown a fountain loud-speaker, which attracted great attention at the Radio World's Fair. Miss Jackson and Miss Summers are listening to this novel reproducer.
© Wide World Photo.



The driving pin for this three-foot clam-shell loud-speaker cone is located below the center, in the neighborhood of the ship's hull. © Herbert Photos, Inc.





radio industry has entered a new era; for the first time in its history it is showing itself to be on a sound basis, and lined up in the same class of substantial manufactures as the automobile, the moving picture and the phonograph. Healthy competition has eliminated for all time the fly-by-night manufacturer, the early-day radio bootlegger and the "big-profit men" with their apparatus poorly constructed of cheap material.

The most noticeable improvements in radio apparatus this season are in set design and construction. Most of the receivers on exhibition employ from six to ten tubes, are totally shielded, and resort to loop aerials as a collective agency. This is certainly a step in the right direction. Sensitivity has been

(*Continued on page* 600)

(Above) An interesting 40-meter transmitter. In Mr. von Brandt's right hand is the 50-watt European tube used in the set.

(Right) The broadcasting studio at the Radio Fair, from which an almost continuous program was put on the air by the different New York stations during the show. © Herbert Photos, Inc.

What Chemistry Has Given to Radio

By O. IVAN LEE

The Spirit of Chemistry is shown evoking with her magic wand the devices that have made possible the wonderful progress of the art in the past two decades. As a matter of sober fact, however, the process has been less simple. Genius is "an infinite capacity for taking pains;" and the chemists of the world have spent aeons of time in the slow, patient study and testing of the products of their crucibles and retorts in order to determine what substances are best fitted for the purpose assigned. Metallurgy, organic chemistry, the most involved delving with the aid of mathematical formulae into the long unbroken privacy of the atom—all have been taxed to the utmost of science's resources in order to make your apparently-simple radio receiver a more efficient device, and the programs which issue from its speaker more faithful reproductions. Mr. Lee in this article tells us about some of the discoveries which have been made and turned to good account in radio by the toiling chemists.

ONE of the beneficent aspects of the late war, considered from the standpoint of popular education, has been the widespread dissemination and the firm implantation in the public consciousness of the fact that chemistry is one of the most fundamental of the sciences, not only in the stress of war, but also in times of peace, crossing and re-crossing our daily lives at a multitude of points. The facility with which a factory for the manufacture of synthetic perfumes, flavoring or dyestuff materials can be converted to the production of poison gases, has become generally appreciated; so much so, in fact, that the futility of effectively prohibiting such a war-time measure is likewise widely recognized.

The obligations of the physician and the pharmacist, the paint, paper and textile manufacturers and even the baker, to the versatile art of the chemist, have all been more or less explained and acknowledged. It is not so well understood, however, that one of the very newest of our great technical industries—that of radio—rests upon a secure chemical foundation.

RADIUM AND THE GAS MANTLE

Take, for instance, the vacuum tube, that Aladdin's lamp of the genie of physics—most sensitive, most intricate, most amazing product of science in daily use—evolved to be sure by physicists, but owing its development no less to the facts and theories clustered around the miraculous metal presented by the chemist at the advent of the twentieth century—radium. This paradox of science possesses, in itself, the power of causing in the space surrounding it, the transformation of a non-conductive gas into a tolerable conductor, caused by the formation of those sub-atomic bullets we have come to know as *ions*. Their presence is quickly shown by the collapse of previously-electrified divergent leaves of gold, when radium is brought near. In the radio vacuum tube, these self-same ions are laboriously brought into being between the plate, grid and the filament by the clumsy but effective expedient of heating a *tungsten* wire through the agency of a battery. It is not enough to have merely a hot tungsten wire, however. The necessary abundance of ions is supplied by the presence of another and technically younger rare metal of the chemist—*thorium*. This is the metal whose oxide, in a stocking-like shape, has long served as the common gas mantle. More recently, the process of isolating the metal itself in a malleable form has been perfected so that it might be conveniently incorporated with the tungsten filament, to be driven off later by a process akin to evaporation, yielding the indispensable ions. Of such stuff is radio music made!

OXYBENZYLMETHYLENEGLYCOLANHYDRIDE!

This is the chemical name of the substance that is perhaps more useful to radio than any other with the exception of copper. It is, however, more familiarly known as "bakelite", and is employed for panels, dials, coil forms, sockets, insulators, and for all purposes where strength, lightness, high insulating qualities and beauty of finish are prime requisites. The pure material greatly resembles amber in appearance, although not so brittle, and is made by the chemical combination of the well-known powerful germicides, carbolic acid and formaldehyde. For radio purposes, fillers are used to increase the strength and lower the cost, and pigments to give various colors. Commercially these varieties are sold under a variety of trade names, which practice is sometimes rather confusing to the purchaser."

HARD-RUBBER AND THE "ACCELERATORS"

Vying with "bakelite" in popularity in radio receivers is "hard rubber," vulcanite or ebonite, as it is termed. This material is ever popular because of its cheapness and ease of working. In recent years, the hardening or vulcanization of rubber, which transforms it from a tacky gum into a useful elastic substance or durable solid like black ivory, has received a great deal of attention from chemists; to the end that

(*Continued on page* 586)

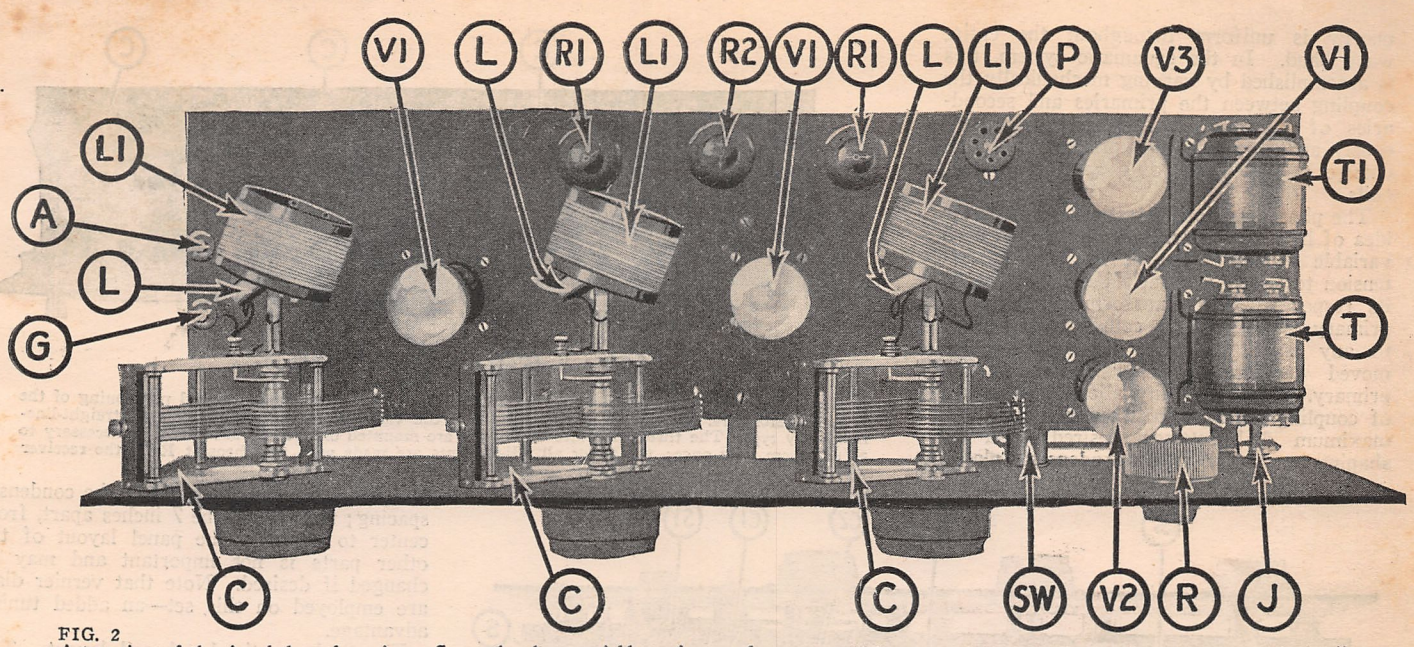


FIG. 2
A top view of the Autobalanced receiver. C are the three variable tuning condensers to which are attached the R.F. transformers, composed of coils L and L1. Coils L, which are the primaries, are attached directly to the condenser shafts and so are rotatable. R1 and R2 are filament rheostats, R a "master" rheostat for all tubes. V1 are 201-A tubes, V2 is a special detector tube and V3 a power amplifier. A and G are the aerial and ground binding posts, T and T1 the A.F. transformers, P is the battery cable receptacle, J the loud speaker jack and SW the filament switch.

An Autobalanced Receiver

A Set With Automatically-Coupled R. F. Transformers

By CLYDE J. FITCH

THE five-tube tuned-radio-frequency set is the most popular for broadcast reception and it should be. When one compares its many advantages with those of other types of sets, there is little wonder that the other sets are completely out-distanced in their race for popular approval. The perfect tuned-R.F. set is selective, non-radiating, operates efficiently on both distant and local stations, is easily tuned and can be calibrated or logged, and it introduces virtually no distortion in the reproduced music.

However, there is one serious disadvantage of this type of set; it fails to operate uniformly over the entire broadcast wavelength band. You have probably noticed, when tuning one of these sets, that it is not quite sensitive enough on the upper dial settings to receive DX, works exceptionally well on the middle dial settings (from, say, 30 to 60) and oscillates or squeals incessantly on the lower dial settings. A set that behaves in this manner is obviously unbalanced. It is the problem of balancing the set that has baffled radio engineers.

Heretofore the balancing schemes of merit depend upon the electrical characteristics of the circuits for their operation, as in the neutrodyne, isofarad, and others. A new method developed by E. H. Loftin and S. Y. White combines both electromagnetic and electrostatic coupling between the R.F. stages to obtain uniform amplification throughout the entire range. But in the set about to be described, mechanical, and not electrical, means are provided to balance automatically the set. The "equamatic" system, developed by Louis G. King, is employed for automatically varying the coupling with the frequency.

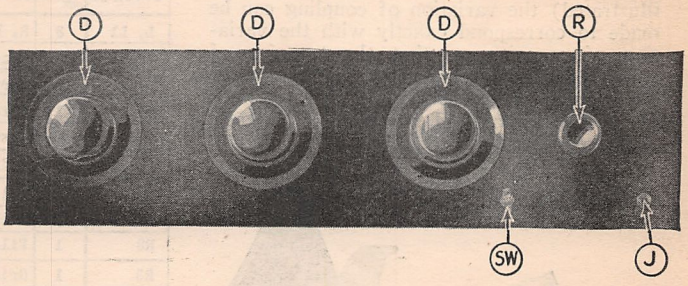


Fig. 1
The front view of the completed set. D indicates the variable condenser control knobs and R that of the "master" rheostat, in series with the main "A—" battery lead, and employed for the purpose of compensating any voltage drop in the storage battery without having to re-adjust the other rheostats.

DESCRIPTION OF EQUAMATIC SYSTEM

In the ordinary tuned-R.F. circuit, using fixed coupling between the primary and secondary windings of the R.F. transformers, the transfer of energy between the primary and secondary varies with the wavelength to which the secondary is tuned. On the lower wavelengths, the transfer is greater than on the upper wavelengths. It is this effect that causes the set to oscillate on the lower settings and to amplify poorly on the higher settings. The problem, therefore, is to design the apparatus so that the transfer of

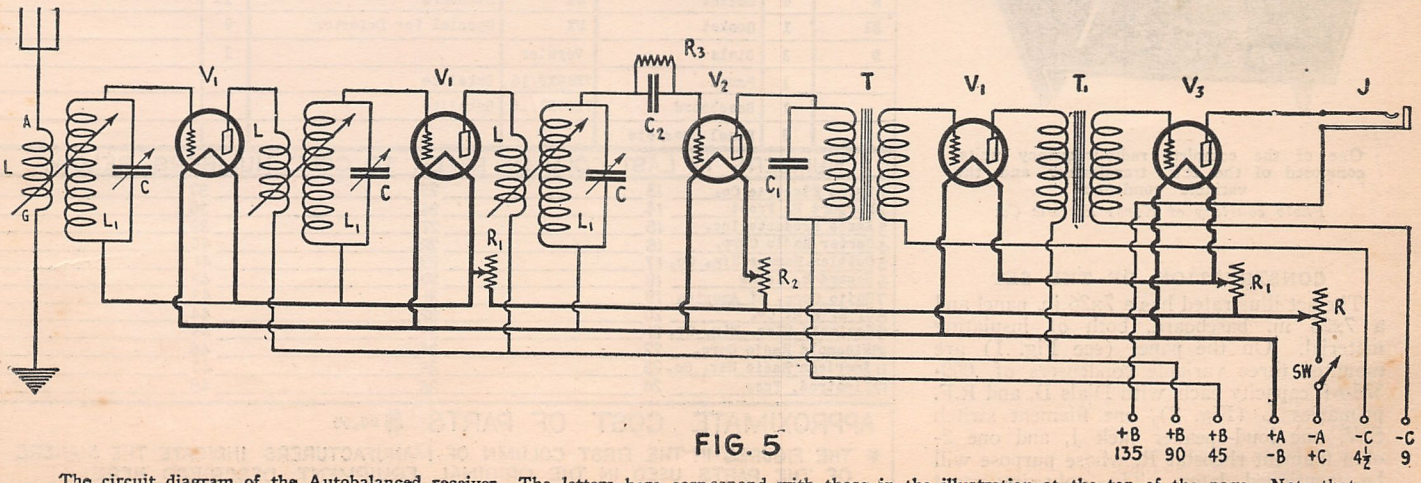


FIG. 5

The circuit diagram of the Autobalanced receiver. The letters here correspond with those in the illustration at the top of the page. Note that 135 volts "B" battery is used on the plate of the last tube (V3) which is a power amplifier.

energy is uniform throughout the entire wave band. In the equamatic system, this is accomplished by varying mechanically the coupling between the primaries and secondaries of the R.F. transformers, simultaneously and in the proper proportion to the change in wavelength of the secondary circuits.

The photographic illustrations give a clear idea of how this is done. The shaft of each variable condenser has at the rear an extension to which is attached the primary of its respective R.F. transformer. Both the primary and secondary coils can be turned to any angle, and the secondary can be moved farther from, or closer to, its primary. This flexibility allows any degree of coupling variation between minimum and maximum dial settings desired; and by shaping properly the condenser plates,

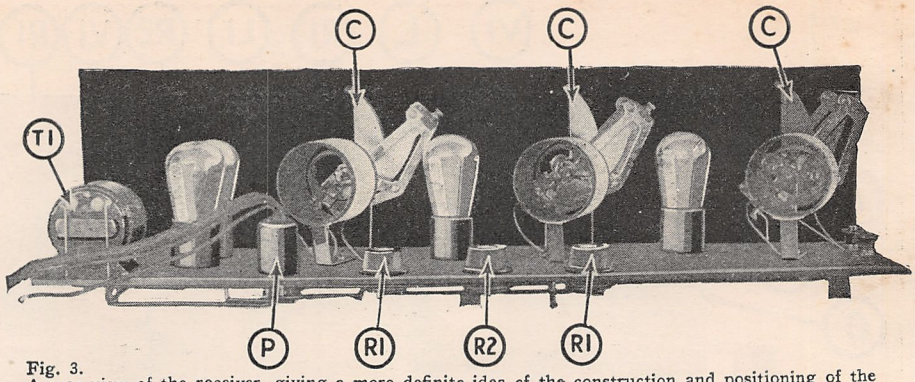


Fig. 3.
A rear view of the receiver, giving a more definite idea of the construction and positioning of the R.F. transformers. It will be noted, also, that the variable condensers are of the straight-line-frequency type. The three rheostats R and R1 are mounted on the sub-base, as it is necessary to adjust them only once; thereafter all adjustments are made with the rheostat R on the receiver panel.

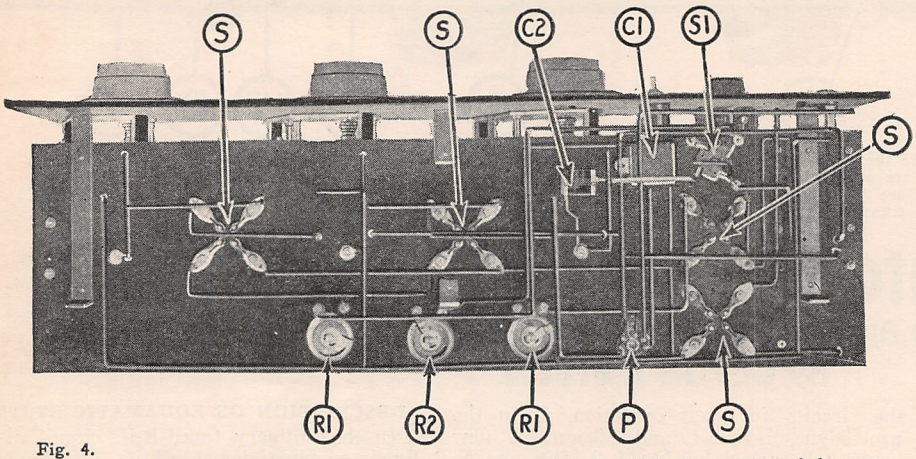
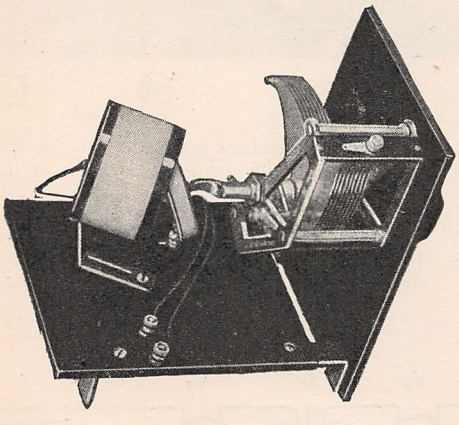


Fig. 4.
A bottom view of the receiver, directly underneath the baseboard, which shows a few of the parts otherwise hidden from view. S are the tube sockets, S1 is the special detector tube socket, of the non-microphonic type. C1 is a by-pass condenser and C2 the grid condenser.

(which, of course, is done in the condensers illustrated) the variation of coupling can be made to correspond exactly with the variation of capacity, so that the transfer of energy is uniform over the whole range. The elusive oscillations at the lower settings are thereby eliminated, and the set responds to DX on the upper settings.



One of the complete radio-frequency units, composed of the R.F. transformer and the variable condenser.
Photo courtesy of Karas Electric Co.

CONSTRUCTION OF THE SET

The set illustrated has a 7x26 in. panel and a 7x25 in. baseboard, both of insulating material. On the panel (see Fig. 1) are mounted three variable condensers of .000375-μf. capacity each, with Dials D, and R.F. primaries L (Fig. 2), one filament switch SW, one loud-speaker jack J, and one 2-ohm filament rheostat R, whose purpose will be mentioned later. The only important thing about the panel layout is the condenser spacing; they should be 7 inches apart, from center to center. The panel layout of the other parts is not important and may be changed if desired. Note that vernier dials are employed on this set—an added tuning advantage.

Fig. 2 shows the baseboard layout. The baseboard is mounted about one inch away from the panel, on brackets, and about one inch above the bottom of the panel, which leaves room underneath it for the wiring. On the baseboard are mounted the aerial and ground binding posts A and G, the three R.F. transformer secondaries L1, two 10-ohm rheostats R1, one 15-ohm rheostat R2, battery cable plug P, audio transformers T and T1, and five vacuum-tube sockets S, S1. The two audio transformers are placed so that their primary terminals are adjacent, as indicated by the B and P binding posts.

The secondary coils L1 should be mounted

(*Continued on page* 593)

SYMBOL	QUANTITY	NAME OF PART	VALUE OF PART	REMARKS	MANUFACTURER*	
L, L1	3	R. F. Trans.		Special	1	
AG	2	Binding Posts			11	
C	3	Variable Cond.	.00037 Mf	S. L. F. Tuning	1	
C1	1	Fixed Condenser	.0002 Mf	Bypass	10	12
C2	1	Fixed Condenser	.00025 Mf	Grid Condenser	10	12
T, T1	2	Audio Trans.		Low Ratio	1	
R	1	Fil. Rheostat	2 ohm	Master Control	2	12
R1	2	Fil. Rheostat	10 ohm	Radio & Audio Control	2	12
R2	1	Fil. Rheostat	15 ohm	Detector Control	2	12
R3	1	Grid Leak	2 meg.	For Detector	3	12
J	1	Jack	S. Cir.	For Loud Speaker	4	12
SW	1	Switch		For Filaments	5	12
P	1	Plug	7-Wire	Battery Cable	6	
V1	3	Tube	201-A		7	8
V2	1	Tube	Type H	Special Detector	8	7
V3	1	Tube	112-171	Power Tube	7	8
S	4	Socket	UX	Standard	11	
S1	1	Socket	UX	Special for Detector	9	
D	3	Dials	Vernier		1	
	1	Panel	7X26X3/16	Bakelite		
	1	Baseboard	7X25X3/16	Bakelite		
	3	Panel Brackets			1	

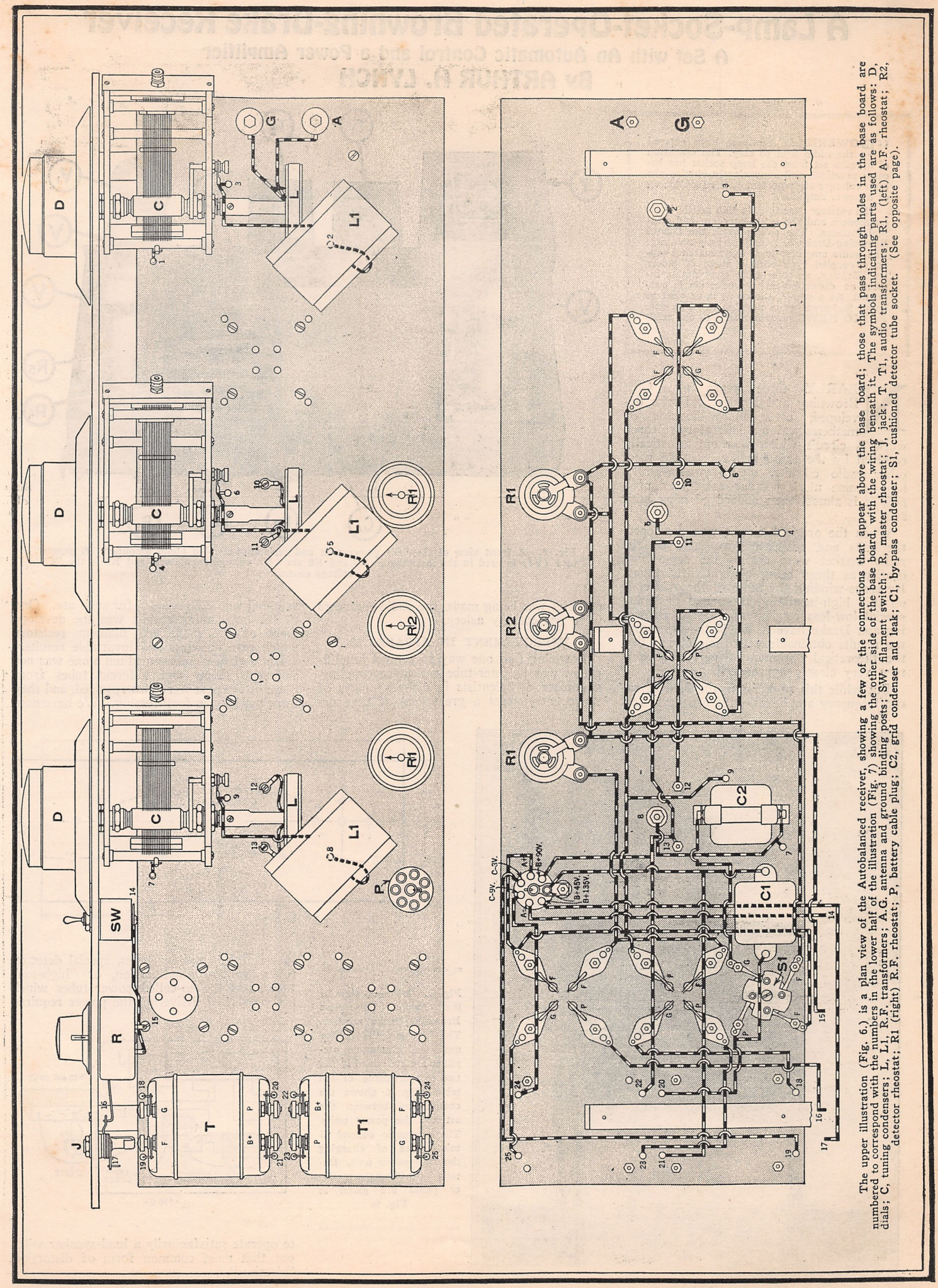
NUMBERS IN LAST COLUMN REFER TO CODE NUMBERS BELOW.

1 Karas Electric Co.	13	25	37
2 Herbert H. Frost	14	26	38
3 Amsco Products Inc.	15	27	39
4 Carter Radio Corp.	16	28	40
5 Cuttler-Hammer Mfg. Co.	17	29	41
6 Howard B. Jones	18	30	42
7 Radio Corp. of America	19	31	43
8 C. E. Mfg. Co.	20	32	44
9 Benjamin Elec. Mfg. Co.	21	33	45
10 Micamold Radio Corp.	22	34	46
11 American Radio Hdw. Co.	23	35	47
12 Electrad, Inc.	24	36	48

APPROXIMATE COST OF PARTS $65.00

* THE FIGURES IN THE FIRST COLUMN OF MANUFACTURERS INDICATE THE MAKERS OF THE PARTS USED IN THE ORIGINAL EQUIPMENT DESCRIBED HERE.

Form Copyright E. P. Co., '26.



The upper illustration (Fig. 6.) is a plan view of the Autobalanced receiver, showing a few of the connections that appear above the base board; those that pass through holes in the base board are numbered to correspond with the numbers in the lower half of the illustration (Fig. 7) showing the other side of the base board, with the wiring beneath it. The symbols indicating parts used are as follows: D, dials; C, tuning condensers; L, L1, R.F. transformers; A.G. antenna and ground binding posts; SW, filament switch; R, master rheostat; J, jack; T, T1, audio transformers; R1, (left) A.F. rheostat; R2, detector rheostat; R1 (right) R.F. rheostat; P, battery cable plug; C2, grid condenser and leak; C1, by-pass condenser; S1, cushioned detector tube socket. (See opposite page).

A Lamp-Socket-Operated Browning-Drake Receiver

A Set with An Automatic Control and a Power Amplifier

By ARTHUR H. LYNCH

"POWERIZED" receivers have entered the radio field to stay. The operation of a radio set from the lamp socket has become practical, and conveniently obtains the high voltages all-important to the functioning of a power amplifier.

The receiver described in this article is ultra-modern and has many excellent and original features. The circuit used, the famous Browning-Drake, is noted for its sensitivity. The audio amplifier is of the resistance-capacity coupled type with a stage of power amplification, an unbeatable combination insofar as distortionless reproduction is concerned. As a whole, the outfit is as near to being fool-proof as is possible to make one. RADIO NEWS recommends it to our readers.

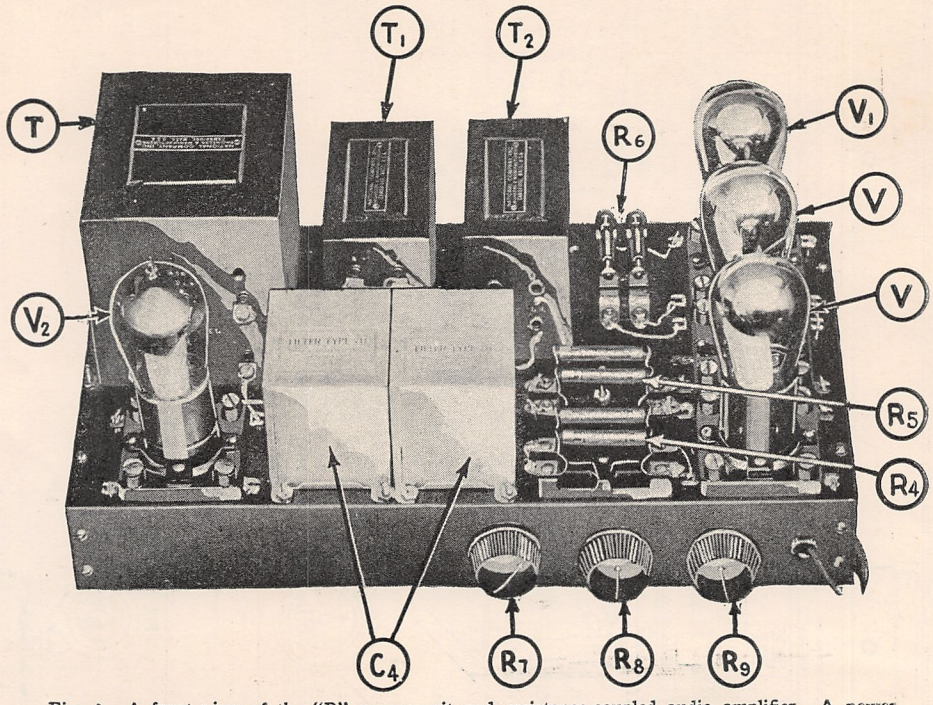


Fig. 4. A front view of the "B" power unit and resistance-coupled audio amplifier. A power tube (V1) is used in the last stage. R7 and R8 are "B" voltage regulators, and R9 is the "C" voltage control.

NEARLY three years ago Glen Browning and Frederick Drake developed, after many months of mathematical and laboratory research work, a circuit which was enthusiastically received by the radio public. Unlike most other radio circuits, the Browning-Drake has become more popular each year until now it is almost the standard of home-built sets.

When the original circuit was developed, the coils and condensers available on the radio market were not of the same high quality as those being manufactured today. By space-winding the turns of the grid coils on thin high-insulating tubes and designing special low-loss condensers, Messrs. Browning and Drake have managed to so improve the results obtainable with their circuit that the theoretical optimum of performance is now very closely approached.

But while this progress in the field of radio-frequency amplification at broadcast frequencies was being made, the audio engineers were not entirely asleep.

IMPROVEMENT IN APPARATUS

Realizing that one way to perfect amplification was by inter-tube resistance coupling, a number of scientists in different parts of the country spent a great deal of time developing suitable resistors for such use. One of the outstanding results was the development of the metallized filament resistors which give noiseless and invariable results.

But a good coupling medium alone was not sufficient. New and different tubes from those of the past were also required, and they were not long in forthcoming. We have now special R.F. amplifier tubes, special detector tubes, voltage amplification, or "high-mu" tubes, and the so-called power tubes which are capable of delivering the power required to operate satisfactorily a loud-speaker without that most common form of distortion, "blasting."

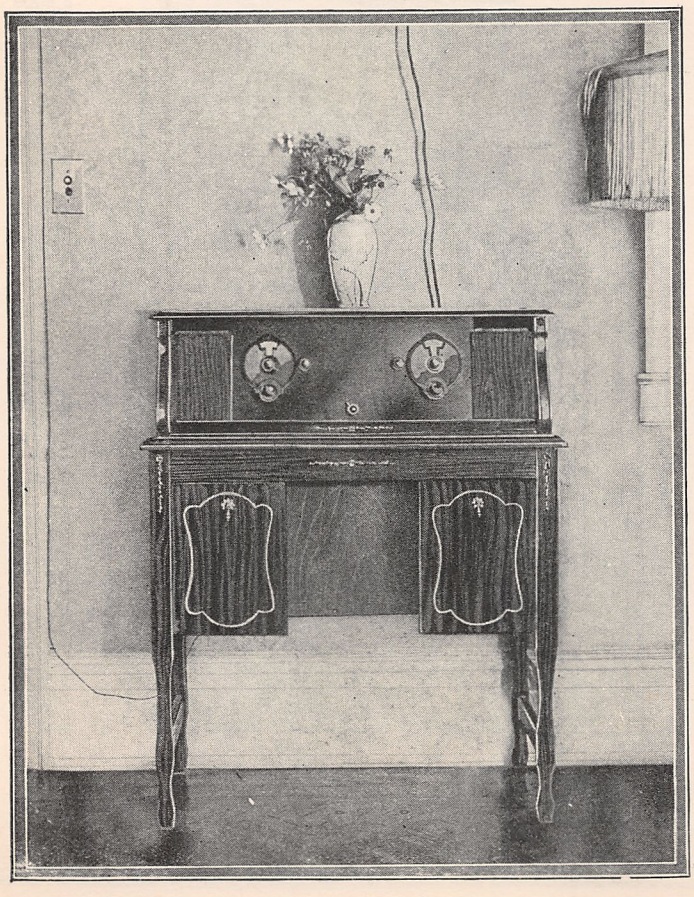
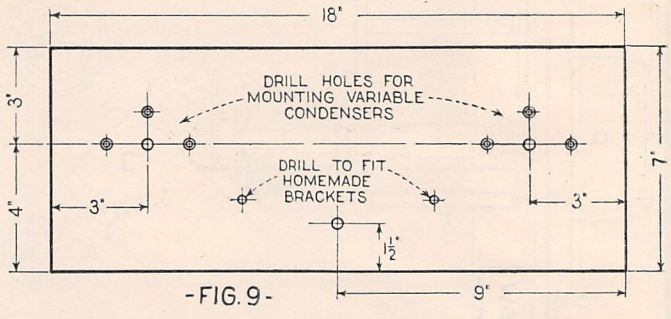
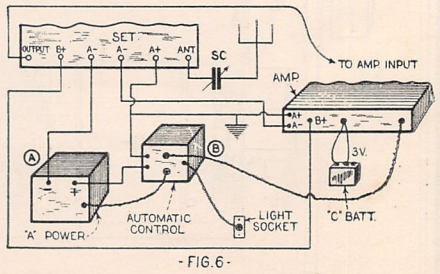


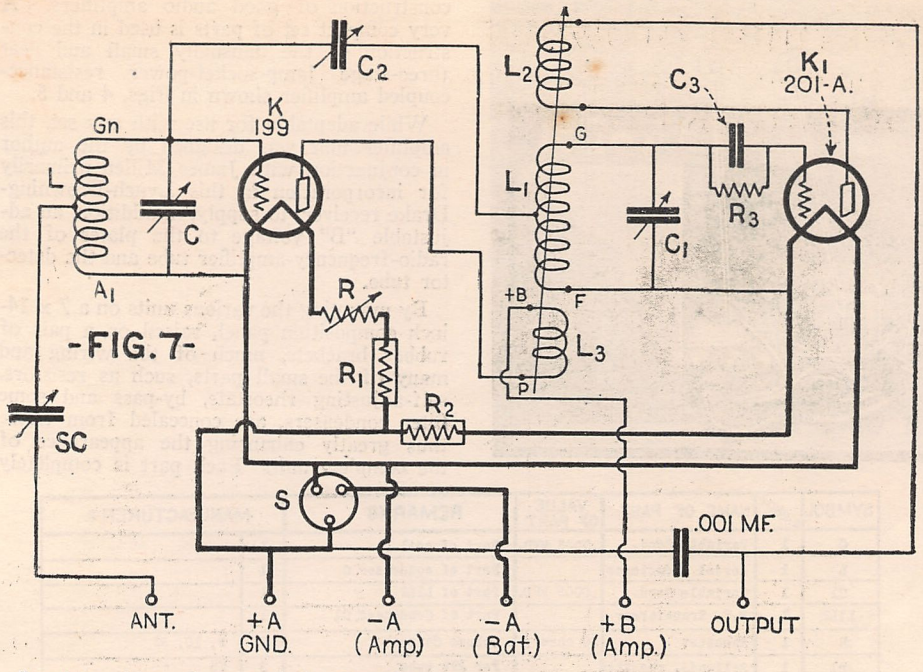
Fig. 1. Left—A view of the complete batteryless Browning-Drake receiver. The "A" and "B" power units and the audio amplifier are contained in the two compartments of the table. Fig. 6 shows the connections between the set and the power units. The automatic control B takes care of charging the "A" power unit. Details for drilling the receiver panel are given in Fig. 9.



-FIG. 9-



-FIG. 6-



Complete wiring diagram of the Browning-Drake receiver. The indicating letters correspond to those in the picture below of the receiver as seen from the rear.

With all of these essential components of a better amplifier available, it was not long before several engineers had brought them together into an amplifier that could deliver full volume with well-nigh perfect quality. Much credit for the development and design of high-grade lamp-socket amplifiers of the resistance-coupled type, such as described in this article, is due to James Millen.

And then, to complete the chain, the first models of the cone or disc speaker, with its wide and uniform frequency characteristic, were placed on the market. This fall practically all the better class of manufacturers are making speakers which almost defy further improvement.

USE OF POWER UNITS

By taking the best in the radio-frequency amplification field and combining it with the best in the audio amplification field, a truly fine receiver is obtained. But why stop here? Not only is practical lamp-socket operation an accomplished feat, but during the past year the shortcomings and imperfections of the original devices have been overcome. In many ways, such as elimination of common plate-circuit coupling, supply of high-voltage (so essential for good quality), saving in replacement and maintenance, and economy of operation, the power units have an advantage over batteries.

So far as the "A" battery is concerned, while it actually exists within the "A" power case, to all intents and purposes, it too has been replaced; for who need know that it still exists, when it requires practically no maintenance? The automatically-controlled noiseless charger runs whenever the set is not in use, keeping the battery always fully charged and ready to give the best of service. The cell vents are vapor-proof, so that no corrosive acid fumes or spray can harm or corrode the interior of the cabinet; and large reserve water space is provided above the cells in order to make the addition of water more than once a year rarely necessary. And as for economy, a battery always kept fully charged need not be nearly as large as one which must have sufficient capacity to serve for several weeks at a time between the charging periods. Thus, the initial and final cost of the complete "A" power unit differs but little from that of a large storage battery.

The result of a careful and harmonious combination of the work of the best engi-

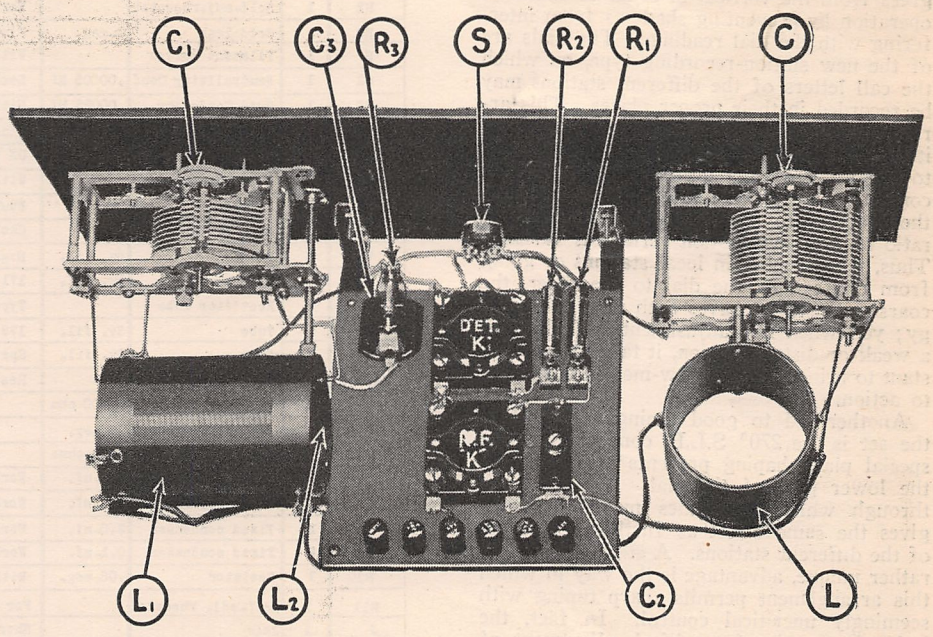
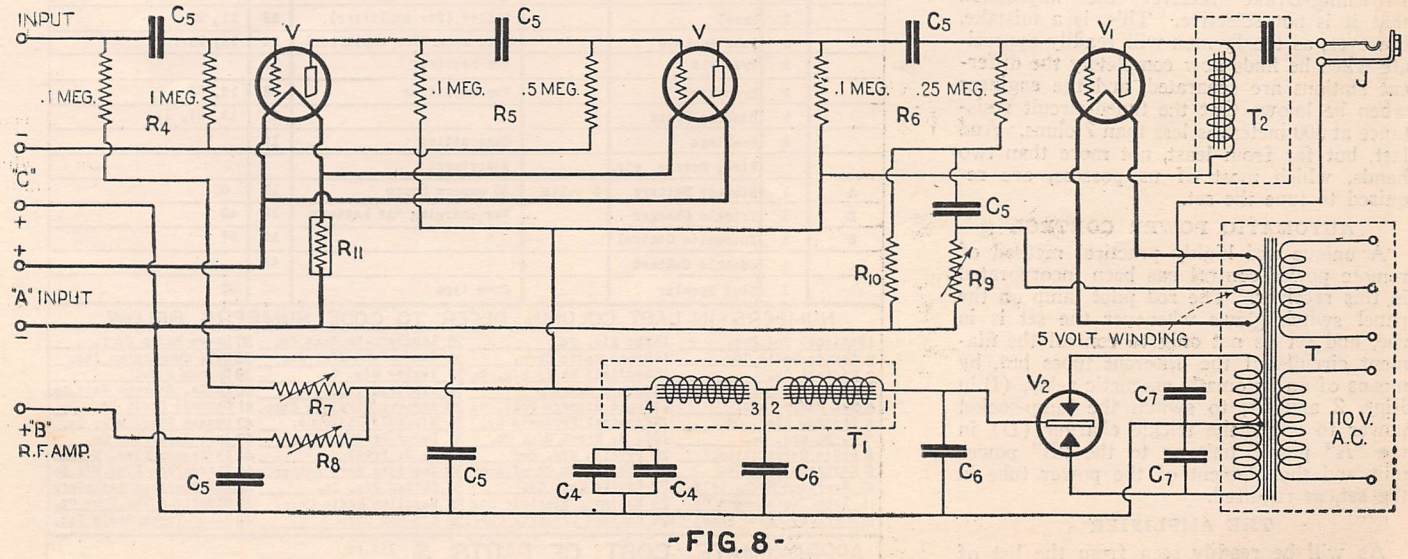


Fig. 3. Interior view of the receiver. A 199 tube is employed in the R.F. socket and a 201-A in the detector socket. C2 is the adjustable neutralizing condenser.



-FIG. 8-

The complete circuit diagram of the combination "B"-power supply and resistance-coupled audio amplifier. V are "high Mu" tubes. Note that the filament of the power tube V1 is lighted from a special 5-volt winding of the power transformer T. The "C" voltage for the power tube is supplied through the combination of R9, R10, and C5.

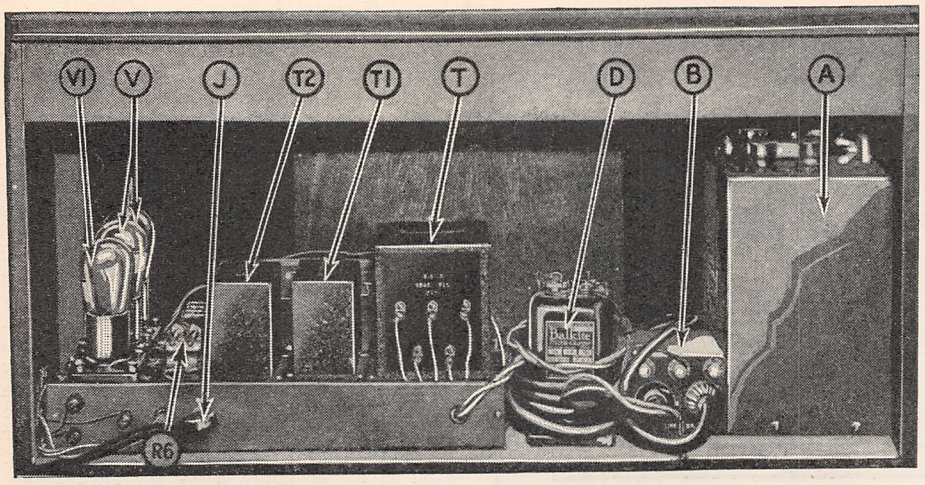


Fig. 2. The complete power-supply unit and audio amplifier. A is the low-capacity storage "A" battery, B the automatic control and D the trickle charger. The other letters correspond to those in Figs. 4, 5 and 8.

neers in their own individual fields is the receiver shown in Fig. 1.

The panel is sloped at an angle of 25 degrees from the vertical in order to facilitate operation by preventing shadows from interfering with the dial readings. The dials are of the new station-recording type, on which the call letters of the different stations may be recorded in their proper places. This arrangement is of considerable advantage, as it enables any one to tune the set immediately to the wave of any desired station without consulting log books and graphs. As a further facility to better tuning, the reduction ratio of the slow-motion vernier is variable. Thus, when tuning in local stations or going from one end of the dial to the other, the coarse adjustment saves both time and energy; yet, when fine adjustment is desired on a weak or distant station, it takes but an instant to bring the full slow-motion device into action.

Another aid to good tuning embodied in the set is the 270° S.L.F. condensers. The special plate-shaping prevents congestion on the lower part of the dial. The 270° arc through which the plates may be rotated gives the same effect as further separation of the different stations. A still further, and rather unique, advantage is the way in which this arrangement permits sharp tuning with seemingly uncritical control. In fact, the lack of necessity for critical adjustment of the tuning dials ofttimes tends to give one not familiar with the operation of the new Browning-Drake receiver the impression that it is not selective. This, is a mistake, however, as the layman will readily appreciate when he finds how completely the different stations are separated, and the engineer when he knows that the tuned-circuit resistance at 300 meters is less than 7 ohms. And last, but far from least, not more than two hands, which most of us possess, are required to tune the set.

AUTOMATIC POWER CONTROL

A unique and highly practical method of remote power control has been incorporated in this receiver. The red pilot lamp on the panel switch glows whenever the set is in use, and serves not only to control the filament circuits of the different tubes but, by means of an automatic magnetic relay, (B in Figs. 2 and 6), to switch the lamp-socket power to either the trickle charger (D) in the "A" power unit or to the "B" power unit and the filament of the power tube in the set, as required.

THE AMPLIFIER

As will be readily seen from the list of parts accompanying this article, a number of prominent manufacturers of high grade radio equipment are producing parts for the construction of good audio amplifiers. A very compact set of parts is used in the construction of the unusually small and neat three-stage lamp-socket-power resistance-coupled amplifier shown in Figs. 4 and 5.

While adaptable for use with any set, this amplifier unit was designed by the author in conjunction with James Millen primarily for incorporation in this Lynch-Browning-Drake receiver, to supply, in addition, an adjustable "B" voltage to the plates of the radio-frequency-amplifier tube and the detector tube.

By mounting the various units on a 7 x 14-inch composition panel, raised on a pair of rubber brackets, much of the wiring and many of the small parts, such as resistors, self-adjusting rheostats, by-pass and some filter condensers, are concealed from view; thus greatly enhancing the appearance of the complete unit. Each part is completely

SYMBOL	QUANTITY	NAME OF PART	VALUE OF PART	REMARKS	MANUFACTURER*	
C	1	Variable Cond.	.0005 MFD.	Part of coil L	1	
L	1	Aerial Inductance		Part of condenser C	1	
C1	1	Variable Cond.	.0003 MFD.	Part of L1L2	1	
L1L2	1	R.F. Transformer		Part of Condenser C1	1	
R	1	Rheostat	30 ohms	Volume Control	28	2, 10, 32
R1	1	Self-adj. rheostat		For 199 tube	3	25
R2	1	Self-adj.rheostat		For 201-A tube	3	25
R3	1	Grid leak	2-meg.	Fixed	4	29, 37, 39
S	1	Filament Switch		With pilot light	2	14, 27, 28
C2	1	Neutralizing Cond	.00005 Mf	Lock adjustment	5	20, 26
C3	1	Grid Condenser	.00025 Mf	With grid leak mounting	6	28, 29, 30
SC	1	Variable Cond.	.000025Mf	Midget type	28	20, 26
K,K1	2	Tube socket		UX type	13	23, 24
T	1	Power Trans.		With 5 volt fil. winding	1	35,41,42,43,44,45,46
T1	1	Filter		Double Choke	1	35,41,42,43,44,45,46
T2	1	Tone Filter		Choke & 4mf condenser	1	35,41,42,43,44,45,46
V	2	Tube	5v. fil.	High Mu type	7	37, 47
V1	1	Tube	5v. fil.	171 type power tube	8	38
V2	1	Rectifier Tube		Type BH	9	
K	1	Tube	3v. fil.	199 type (RF amplifier)	7	8, 36, 38
K1	1	Tube	5v. fil.	Special Detector	7	36
R4,5,6	1	Resistance Amp.		Resistors & mountings	4	29, 37, 39
R7	1	Var. Resistance	5,000 ohm		28	2, 10, 32
R8	1	Var. Resistance	.5 meg.		28	2, 10, 32
R9	1	Var. Resistance	2500 ohms		28	2, 10, 32
C4	2	Filter condenser	4.0-mf.	Working voltage of 200	11	6, 34, 35
C5	6	Fixed Condenser	1.0-mf.	Working voltage of 200	11	6, 34, 35
C6	2	Fixed condenser	2.0-mf.	Working voltage of 200	11	6, 34, 35
C7	2	Fixed condenser	0.1-mf.	Working voltage of 500	11	6, 34, 35
R10	1	Resistor	.05-meg.	With mounting	4	29, 37, 39
R11	1	Self-adj. rheostat		For 112 type tube	3	25
J	1	Jack		Short type open circuit	2	27, 28
	1	Panel		7"X18" (For receiver)	33	21, 22
	1	Panel		7"X6" (For receiver)	33	21, 22
	1	Panel		7"X14" (For amplifier)	33	21, 22
	2	Panel		3"X14" (For amplifier)	33	21, 22
	4	Tube sockets		U.V. type (For amplifier)	24	13, 23
	2	Brackets		For receiver	14	
	2	Brackets		For amplifier	33	15, 23
	9	Binding Posts			5	13, 21, 31
	8	Bushings		Composition	16	
		Wire, Screws, etc.		Assortment		
A	1	Storage Battery	6 volts	60 ampere hours	17	40
D	1	Trickle Charger		For charging "A" battery	18	40
B	1	Automatic Control			19	27
	1	Console Cabinet			48	
	1	Loud Speaker		Cone type		22

NUMBERS IN LAST COLUMN REFER TO CODE NUMBERS BELOW.

1 National Co. Inc.	13 Eby Mfg. Co.	25 Langbein-Kaufman Co.	37 Daven Radio Corp.
2 Carter Radio Co.	14 Bruno Radio Corp.	26 Hammerlund Mfg. Co.	38 E.T. Cunningham Inc.
3 Radiall Co.	15 Garfield Radio Mfg. Co	27 Yaxley Mfg. Co.	39 Durham & Co.
4 Arthur H. Lynch, Inc.	16 Hart & Hegeman	28 Electrad Inc.	40 Phila. Storage Batt. Co.
5 X-L Radio Labs.	17 Gould Storage Batt. Co	29 Aerovox Wireless Corp.	41 General Radio Co.
6 Sangamo Elec. Co.	18 Fansteel Products Co.	30 Micamold Radio Co.	42 Dongan Elec. Mfg. Co.
7 C. E. Mfg. Co.	19 L. S. Brach Mfg. Co.	31 DeJur Products Co.	43 Acme Apparatus Co.
8 Radio Corporation	20 Precise Mfg. Co.	32 H. H. Frost	44 Jefferson Elec. Mfg. Co
9 Raytheon Mfg. Co.	21 Insulating Co of Amer.	33 American Hard Rubber Co	45 Thordarson Elec. Mfg. Co
10 American Mech. Labs.	22 Pausin Eng. Co.	34 Potter Mfg. Co.	46 All American Radio Corp
11 Tobe-Deutschmann Co.	23 Benjamin Electric Co.	35 Mayolian Radio Corp.	47 Cleartron Vac. Tube Co.
12 Century Radio Panel Co	24 Moulded Products Corp.	36 Ken-Rad Corp.	48 Baker-Yacht-Basin Inc.

APPROXIMATE COST OF PARTS $ 155.00

* THE FIGURES IN THE FIRST COLUMN OF MANUFACTURERS INDICATE THE MAKERS OF THE PARTS USED IN THE ORIGINAL EQUIPMENT DESCRIBED HERE.

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shielded in its own individual case, and all the metal cases are connected together and grounded by a common bus. Small 2 x 14-inch panels box in the under structure, and at the same time serve as terminal boards on which are located the loud-speaker jack (J) and binding posts.

The circuit employs a power transformer which supplies the high voltage to the rectifier tube, which, by the way, is one of the new "BH" tubes. This tube, like its little brother, the "B," works on the gaseous-conduction principle; having no filament, it has an almost limitless life and will serve for thousands of hours without attention. Of course, the "B" tube may be used if desired; but as the different parts of the amplifier have been selected with the "BH" tube in mind, slightly better results will be obtained by its use.

But to get back to the amplifier circuit the power transformer has also a 5-volt filament winding with center-tap for heating the filament of the last audio, or 171-type power tube. The filaments of the first two audio, or "high-mu," stages are supplied from the "A" power unit. By connecting the filaments of the two tubes in parallel a ½-ampere type of self-adjusting rheostat in the common lead is made to serve the purpose of two and an additional part obviated.

The high-voltage output of the rectifier tube is passed through a special filter circuit comprising a double choke and several filter condensers, arranged as shown in the circuit diagram, Fig. 8.

"C" VOLTAGE SUPPLY

By a rather novel arrangement of audio-frequency filter and voltage-drop resistor, the high "C" voltage (approximately 90 volts negative) required for the grid of the last audio, or 171-type tube, is obtained from the "B" supply. If an attempt were made to secure the negative "C" voltage by utilizing the voltage drop across a resistor in the negative plate-supply lead, the result would be rather discouraging; as it would be found that very little amplification was being obtained. This phenomenon is due to the fact that not only would the D.C. component of the space current of the last tube be passing through this resistor, but also the alternating or audio-frequency, component which would produce an alternating voltage. The combination of the alternating and direct voltage

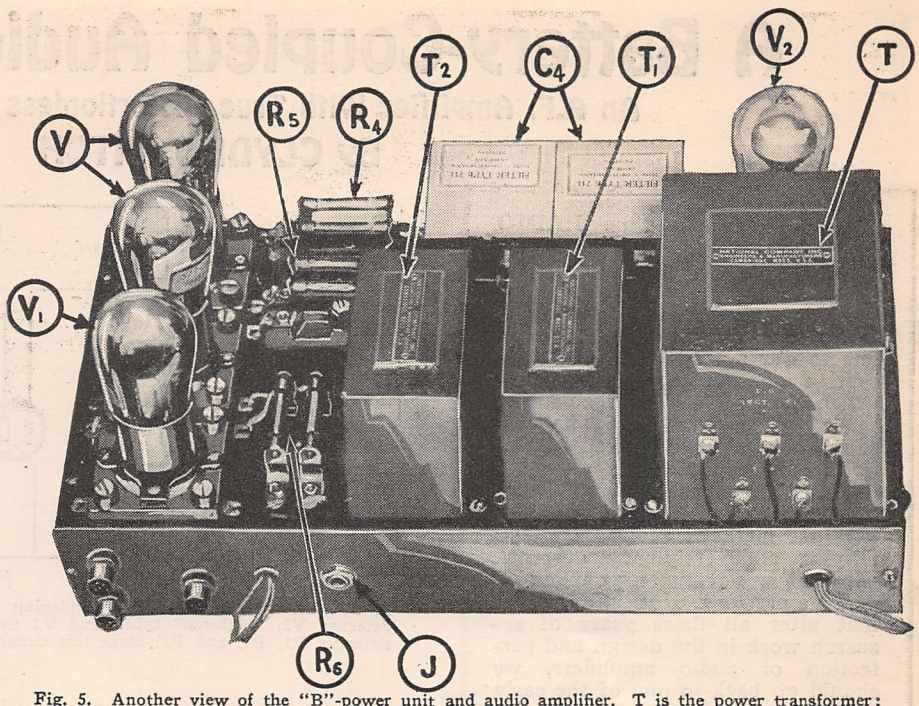

Fig. 5. Another view of the "B"-power unit and audio amplifier. T is the power transformer; T1 the double filter choke; C4 the 8-μf. filter condenser; and T2 the "tone" filter. The amplifier coupling condensers and the other filter condensers are mounted underneath the base.

drops would result in a pulsating biasing voltage having such phase relations as to neutralize the input and result in greatly reduced amplification.

By means of a simple filter circuit comprising a 1.0-μf. condenser (C5) and a .05-megohm resistor (R10) the audio-frequency current is kept from passing through the 2500-ohm variable resistor, (R9) across which the grid-voltage drop is obtained. Thus, as only pure D.C. passes through this resistor, a steady grid voltage is obtained. The proper grid-voltage for a 171-type tube with 180 volts on the plate is 40.5. At this plate voltage and grid bias, with normal load impedance and D.C. resistance, the plate current is approximately 25 milliamperes. It will be of considerable advantage to use a variable resistor for this purpose; as the plate voltage will vary, with different rectifier tubes, set loads, and line conditions, from the assumed value of 180 volts. Once the variable resistor has been properly adjusted for any given set of conditions, no further changes or adjustments will be required.

Two variable resistors are employed in order to obtain lower voltages for the R.F. and detector tubes. A 1.0-μf. condenser is connected from the low voltage side of each resistor to the ground.

The full 180 volts is applied to the plate circuits of the three resistance-coupled-amplifier tubes. Three 0.1-megohm resistors are employed in the plate circuits of the detector and the two "high-mu" tubes, while the grid resistors for the three audio tubes are 1.0-, 0.5- and .25-megohms respectively. The six resistors are mounted in three double bases, which require only one hole each for mounting. Their soldering lugs and clips are stamped from one piece of nickel-plated

(*Continued on page* 524)

LIST OF BROADCAST STATIONS IN THE UNITED STATES

(*Continued from page* 472)

Radio Call Letter	BROADCAST STA. Location	Wave (Meters)	Power (Watts)
WKBC,	Birmingham, Ala.	225	
WKBD,	Jersey City, N. J.	235	
WKBE,	Webster, Mass.	270.1	100
WKBF,	Indianapolis, Ind.	244	
WKBG,	Chicago, Ill.	215.7	100
WKBH,	La Crosse, Wis.	249.9	
WKBI,	Chicago, Ill.	220.4	500
WKBJ,	St. Petersburg, Fla.	280	250
WKBS,	Birmingham, Ala.	225	
WKDR,	So. Kenosha, Wis.	428.3	
WKJC,	Lancaster, Pa.	258	50
WKRC,	Cincinnati, Ohio	325.9 & 422.3	1500
WKY,	Oklahoma City, Okla.	275	100
WLAL,	Tulsa, Okla.	250	100
WLAP,	Louisville, Ky.	275	20
WLB,	Minneapolis, Minn.	277.6	500
WLBL,	Stevens Point, Wis.	278	750
WLIB,	Chicago, Ill.	302.8	4000
WLIT,	Philadelphia, Pa.	394.5	500
WLS,	Crete, Ill.	344.6	5000
WLSI,	Edgewood, R. I.	440.9	500
WLTS,	Chicago, Ill.	258	100
WLW,	Harrison, Ohio	422.3	5000
WLWL,	New York, N. Y.	288.3	5000
WMAC,	Cazenovia, N. Y.	275	100
WMAF,	Dartmouth, Mass.	440.9	1000
WMAK,	Lockport, N. Y.	266	500
WMAL,	Washington, D. C.	212.6	100
WMAN,	Columbus, Ohio	286	50
WMAQ,	Chicago, Ill.	447.5	1000
WMAY,	St. Louis, Mo.	248	100
WMAZ,	Macon, Ga.	261	500
WMBB,	Chicago, Ill.	250	500
WMBC,	Detroit, Mich.	256.4	100
WMBF,	Miami Beach, Fla.	384.4	500
WMBI,	Chicago, Ill.	288.3	500
WMC,	Memphis, Tenn.	499.7	500
WMCA,	Hoboken, N. J.	340.7	500
WMRJ,	Jamaica, N. Y.	227.1	10
WMSG,	New York, N. Y.	302.8	500
WNAB,	Boston, Mass.	280.2	100
WNAC,	Boston, Mass.	430.1	500
WNAD,	Norman, Okla.	254	500
WNAL,	Omaha, Nebr.	258	500
WNAT,	Philadelphia, Pa.	250	500
WNAX,	Yankton, S. Dak.	244	100
WNBH,	New Bedford, Mass.	248	250
WNJ,	Newark, N. J.	348.6	150
WNOX,	Knoxville, Tenn.	268	100
WNRC,	Greensboro, N. C.	223.7	10
WNYC,	New York, N. Y.	526	1000
WOAI,	San Antonio, Tex.	394.5	2000
WOAN,	Lawrenceburg, Tenn.	282.8	500
WOAW,	Omaha, Nebr.	526	1000
WOAX,	Trenton, N. J.	240	500
WOC,	Davenport, Iowa	483.6	5000
WOCL,	Jamestown, N. J.	275.2	15
WODA,	Paterson, N. J.	309.7	1000
WOI,	Ames, Iowa	270	750
WOK,	Homewood, Ill.	217.3	5000
WOKO,	Peekskill, N. Y.	233	50
WOO,	Philadelphia, Pa.	508.2	500
WOOD,	Grand Rapids, Mich.	242	1000
WOP,	(Airplane	300	100
WOQ,	Kansas City, Mo.	278	1000
WOR,	Newark, N. J.	405.2	500
WORD,	Batavia, Ill.	275	5000
WOS,	Jefferson City, Mo.	440.9	500
WOWO,	Fort Wayne, Ind.	227	500
WPAK,	Fargo, N. Dak.	275	50
WPAP,	Cliffside, N. J.	360	100
WPCC,	Chicago, Ill.	258	500
WPDQ,	Buffalo, N. Y.	205.4	50
WPG,	Atlantic City, N. J.	299.8	5000
WPRC,	Harrisburg, Pa.	215.7	100
WPSC,	State College, Penna.	282.8	500
WQAA,	Parkesburg, Pa.	220	500
WQAC,	Amarillo, Tex.	234	125
WQAE,	Springfield, Vt.	246	50
WQAM,	Miami, Fla.	285.5	500
WQAN,	Scranton, Pa.	250	100
WQAO,	Cliffside, N. J.	360	100
WQJ,	Chicago, Ill.	447.5	500
WRAF,	Laporte, Ind.	224	100
WRAH,	Providence, R. I.	235	450
WRAK,	Escanaba, Mich.	256.3	100
WRAL,	Ithaca, N. Y.	365	25
WRAM,	Galesburg, Ill.	244	100
WRAV,	Yellow Springs, Ohio	263	100
WRAW,	Reading, Pa.	238	10
WRAX,	Philadelphia, Pa.	267.7	500
WRBC,	Valparaiso, Ind.	278	500
WRC,	Washington, D. C.	468.5	1000
WRCO,	Raleigh, N. C.	252	100
WREC,	Whitehaven, Tenn.	254	10
WREO,	Lansing, Mich.	285.5	500
WRHF,	Washington, D. C.	256	50
WRHM,	Minneapolis, Minn.	252	50
WRK,	Hamilton, Ohio	270	100
WRM,	Urbana, Ill.	273	500
WRMU,	Richmond Hill, N. Y.	236	100
WRNY,	New York, N. Y.	373.8	500
WRR,	Dallas, Tex.	246	500
WRST,	Bay Shore, N. Y.	215.7	150
WRVA,	Richmond, Va.	256	1000
WSAJ,	Norwood (Cincinnati) O.	325.9	5000
WSAJ,	Grove City, Pa.	229	250
WSAN,	Allentown, Pa.	229	100
WSAR,	Fall River, Mass.	254	100
WSAX,	Chicago, Ill.	268	100
WSAZ,	Pomeroy, Ohio	244	50
WSB,	Atlanta, Ga.	428.3	1000
WSBC,	Chicago, Ill.	288.3	1500
WSBF,	St. Louis, Mo.	273	250
WSBT,	South Bend, In.	275.1	500
WSDA,	New York, N. Y.	263	250
WSKC,	Bay City, Mich.	261	100
WSM,	Nashville, Tenn.	282.8	1000
WSMB,	New Orleans, La.	319	500
WSMH,	Owosso, Mich.	240	20
WSMK,	Dayton, Ohio	275	500
WSOE,	Milwaukee, Wis.	246	500
WSRO,	Hamilton, Ohio	252	100
WSSH,	Boston, Mass.	261	100
WSUI,	Iowa City, Iowa	483.6	500
WSVS,	Buffalo, N. Y.	218.8	50
WSWS,	Wooddale, Ill.	275.1	1000
WTAB,	Fall River, Mass.	266	100
WTAD,	Carthage, Ill.	236	50
WTAG,	Worcester, Mass.	545.1	500
WTAL,	Toledo, Ohio	252	100
WTAM,	Cleveland, Ohio	389.4	3500
WTAQ,	Eau Claire, Wis.	254	1000
WTAR,	Norfolk, Va.	261	100
WTAW,	College Station, Texas	270	500
WTAX,	Streator, Ill.	231	50
WTAZ,	Lambertville, N. J.	261	15
WTIC,	Hartford, Conn.	475.9	500
WWAE,	Electric Park, Ill.	384.4	10,000
WWJ,	Detroit, Mich.	352.7	1000
WWL,	New Orleans, La.	275	100
WWRL,	Woodside, N. Y.	258.5	
6 XBR	(portable)	45-105	150

A Battery-Coupled Audio Amplifier

An A.F. Amplifier With True Distortionless Characteristics

By CLYDE J. FITCH

FROM time to time RADIO NEWS has published descriptions of various types of audio-frequency amplifiers; but never before have we had the opportunity to present a really distortionless one to our readers. With the exception of the negligible amount which may be caused by the vacuum tubes themselves, the battery-coupled amplifier described here is free from all distortion.

The battery-coupled amplifier is not new; in fact it utilizes one of the first methods devised for amplifying audio-frequency currents. Why it is not more popular remains a mystery. How strange it is that after all these years of research work in the design and perfection of audio amplifiers, we should go back to one of the early methods to attain perfection.

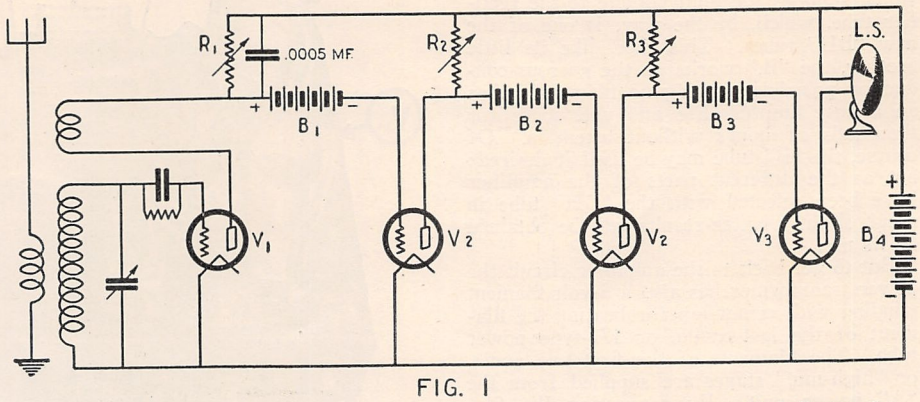

FIG. 1

A true distortionless amplifier, employing battery-coupling between stages. V1 indicates the detector, V2, "high-mu" tubes, and V3 the power tube. The critical adjustments of the resistances R1, R2, and R3, make this circuit impractical, however, for the average constructor.

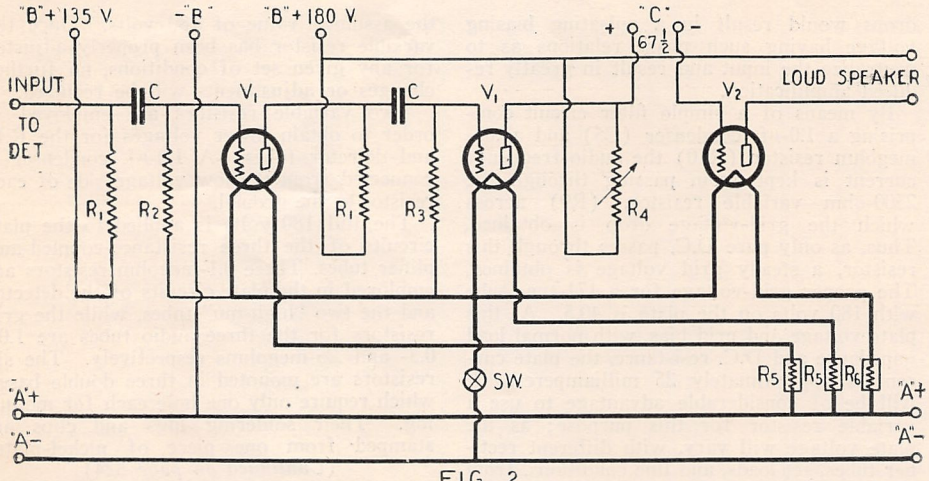

FIG. 2

Diagram of the amplifier shown in the photographic illustrations, which is a compromise between the resistance-capacity- and the battery-coupled-amplifier. The symbols correspond with those of Figs. 4, 5, and 6, the values of which are given in the list of parts.

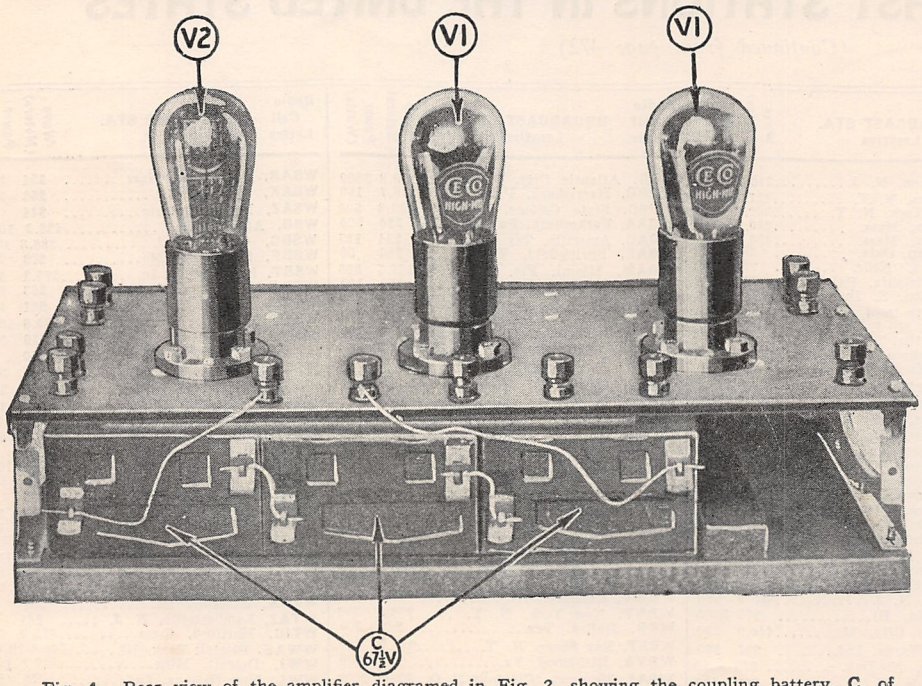

Fig. 4. Rear view of the amplifier diagramed in Fig. 2, showing the coupling battery, C, of the last stage mounted under the panel. Tubes V1 are the "high-mu" tubes, and V2 is the power tube.

THE conquering of distortion in radio receivers seems to be the main problem of the day. As most of the distortion takes place in the audio amplifier, practically all attention has been centered on it. As a result, transformer design has been vastly improved and resistance-capacity coupling is widely used; but the problem of conquering distortion cannot be said to be completely solved.

While it is generally believed that resistance-capacity coupled amplifiers are superior so far as distortionless amplification is concerned, both the coupling condenser and the grid leak introduce distortion into even the resistance-coupled amplifier.

The impedance of the coupling condenser varies with the *frequency* of the currents which it has to pass. It offers less obstruction to the higher frequencies than it does to the lower frequencies. This makes it necessary, in order to amplify the bass notes of musical instruments, to use coupling condensers of large capacity; but the large condensers have greater leakage and the high-potential "B" current leaks through them and blocks the tubes. Therefore, in commercial amplifiers of this type, condensers of small capacity, usually about .006-*μf.*, are employed. A condenser of 0.1-*μf.* seems to be the largest which can be used for all practical purposes.

The distorting effect of the grid leak is also noticeable. It should allow the negative charge accumulated on the grid to leak back to the filament, just sufficiently to keep the mean grid potential at a constant value. The correct resistance could be determined if the amplitude of the current applied to the grid were constant; but it is not. The amplitude is greater when receiving local stations than when receiving DX. Therefore, the value of grid leak resistance must be a compromise, and the mean grid potential will fluctuate.

COUPLING THROUGH BATTERIES

If we could eliminate the grid condenser and grid leak, the resistance-coupled amplifier would be perfect. This is accomplished in the battery-coupled amplifier about to be described. Quality at any cost was the aim, and the battery-coupled amplifier certainly did the trick. The superiority of this amplifier over the resistance-capacity amplifier, contrary to our original belief, was instantly discernable. It must be heard to be appreciated. And, on a good amplifier like this,

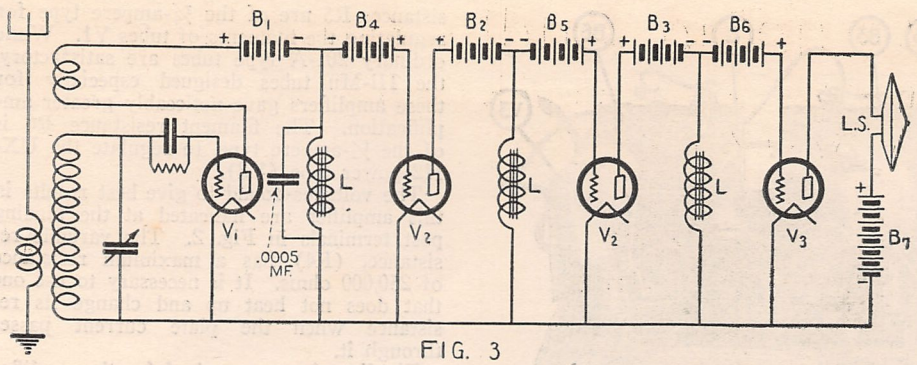

FIG. 3

Circuit of a choke-coil amplifier employing battery coupling. The parts used in this amplifier are illustrated in Fig. 7.

the superiority of the cone over the horn speaker is instantly noticed, especially if a large cone is used—one of three feet or more in diameter, which has no "pitch" of its own within the audible range.

Fig. 1 shows the connections of a battery-coupled amplifier. In this diagram a regenerative detector (V1) is shown connected to a three-stage battery-coupled amplifier.

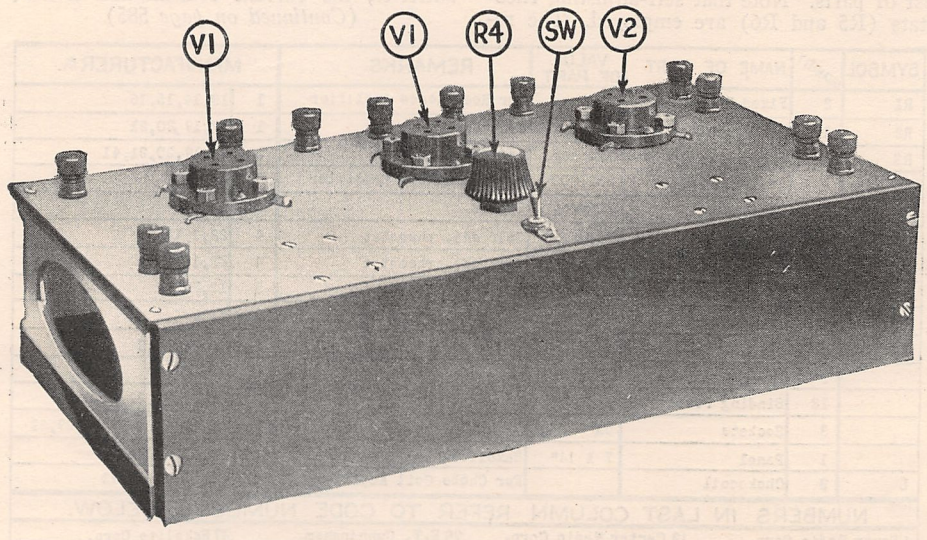

Fig. 5. Front view of the amplifier diagramed in Fig. 2. This shows the locations of the various parts on the panel. Note the variable resistance, R4, for regulating the grid potential of the last, or power tube.

THE THEORY

The difference between this type of amplifier and the resistance-capacity-coupled amplifier is as follows: in the resistance-capacity amplifier, instead of connecting coupling batteries (B1, B2 and B3) in the grid circuits as shown in Fig. 1, blocking condensers are used to insulate the grids of the tubes from the high potential "B" battery, (B4). Now with blocking condensers in the grid leads, the alternating-current component, or rather signal current, passes through the condensers; the positive halves of the waves flowing through from grids to filaments and the negative halves remaining on the grids. The rectifying action of the tubes is the cause of this. In order to prevent the high negative charges from blocking the tubes, grid-leak resistances are required between the grid and filament of each tube.

In the battery-coupled amplifier the condensers and leaks are eliminated, and the high positive potential from the battery, B4, is prevented from paralyzing the grids of the amplifier tubes, by connecting opposing batteries, B1, B2 and B3, in the grid circuits. For example, suppose the battery B4 has a potential of 200 volts and the resistance R1 is 90,000 ohms; also the impedance of the tube V1 is 10,000 ohms. Under these conditions, the potential on the plate of V1 is 20 volts. If the battery B1 were removed a positive potential of 20 volts would be placed on the grid of the tube V2, which, of course, would kill its action as an amplifier. The battery B1, however, also has a potential of 20 volts and is so connected that it neutralizes the 20-volt drop across V1. Therefore, the grid of the tube is at zero potential with respect to the filament. It is evident, therefore, that by proper proportioning of the resistance R1, and the battery B1, the potential on the grid of V2 can be made any desired value. For amplifying purposes it should be a negative potential of one or two volts. In the last stage, where a power tube V3 is employed with the entire potential of B4, except the slight drop across the loud-speaker, applied to the plate, a negative potential of 9 to 12 volts is required on the grid. The correct bias potential for each grid is obtained by adjusting the variable resistances R1, R2 and R3.

REGULATION OF FILAMENT CURRENT

In the diagram of Fig. 1 part of the filament circuit is left out for the sake of clearness. In an amplifier of this type all filaments should have fixed resistances or self-adjusting rheostats, so that the current through each tube remains constant. A slight change in the filament temperature of V1 makes a great change in its plate-to-filament impedance, which change immediately affects the grid potential of V2, and is amplified by all the remaining tubes. The slightest change in the filament current of V1 blocks the entire amplifier and each of the variable resistances R1, R2 and R3, must be readjusted. This shows the importance of having constant filament current for all tubes.

REQUIRES SKILLFUL OPERATION

While the battery-coupled amplifier gives perfect reproduction throughout the entire audio-frequency range, it is recommended only to the more advanced radio fans. It is entirely too critical in adjustment for ordinary broadcast use. As stated in the last paragraph, a slight change in the filament temperature of the detector tube, or for that matter the first audio tube, blocks the entire amplifier.

The reason for this is because this amplifier works at all audio frequencies down to zero; and *zero frequency* is, of course, *direct current*. This action was particularly noticeable when tuning in different stations. We all know that the characteristic curve of a tube is not perfectly straight; also the mean grid potential of V1 varies with the signal strength. On this account all tubes act more or less as detectors.

We also know that when receiving a strong signal from a local station the impedance of the detector V1 is greater than when receiving a weak or distant station. This is indicated by a drop in the plate current, as shown by a milliammeter. Therefore, as the impedance of V1 varies with the strength of the received R.F. currents,

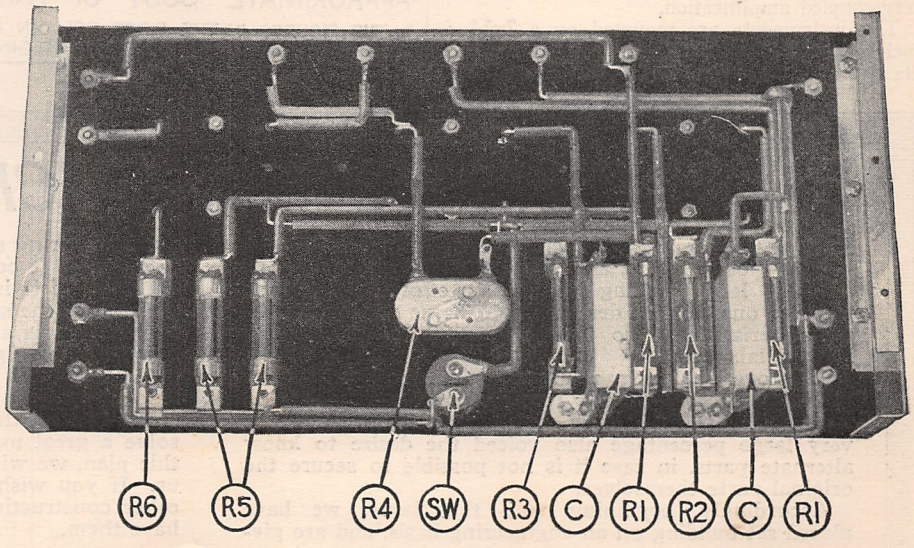

Fig. 6. Bottom view showing the resistances, condensers, and connections, of the battery-coupled amplifier, which may be connected to the detector output of any radio set.

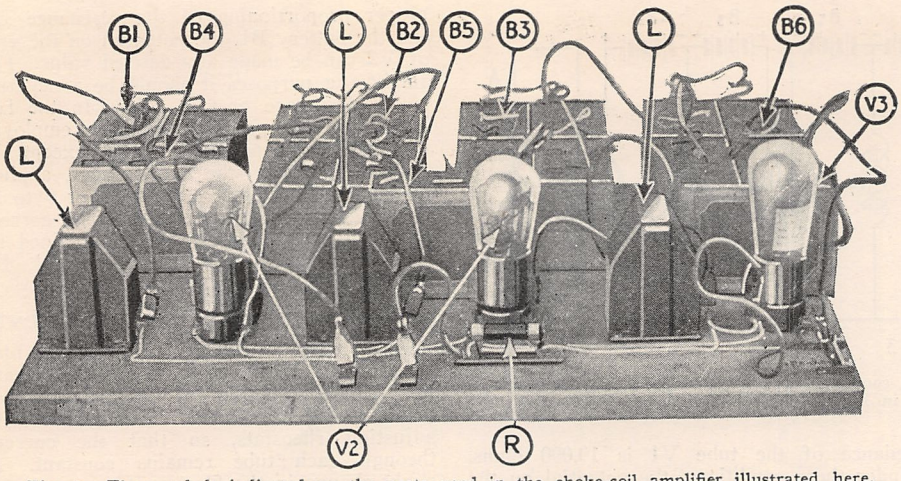

Fig. 7. The symbols indicated on the parts used in the choke-coil amplifier illustrated here, correspond with those in the diagram, Fig. 3.

the amplifier must be readjusted every time a station of different strength is tuned in.

INTERESTING POSSIBILITIES

This peculiar phenomenon, while highly objectionable so far as the broadcast listener is concerned, may be found very advantageous for other special cases. For example, suppose it is desired to receive the loudest local station. Once the amplifier is adjusted for this loud station, none of the other stations can be heard. *In other words, interference is almost completely eliminated.* Tests have not been made as yet to determine the amount of interference caused by static. It would seem that only the static of the same *amplitude* as the signal would be heard.

This amplifier can be adjusted for a weak signal and then loud signals cannot be received at their proper maximum setting. If the loud station is detuned, until it is of the same strength as the weak station, it can be heard. When so adjusted it can be heard on two settings of the dial, one when detuned below, and the other when detuned above, the carrier wave.

A PRACTICAL COMPROMISE

As this amplifier has the advantage of giving distortionless amplification, and at the same time the disadvantage of requiring careful adjustments for each station, a compromise was made in the amplifier shown in the photographs reproduced and diagramed in Fig. 2. In this amplifier the critical adjustments have been eliminated, with a slight sacrifice in quality. It comprises two stages of resistance-capacity-coupled amplification, and one stage of battery-coupled amplification.

The instruments are mounted on a 7x14 inch panel, supported on base board brackets two and one-half inches high. The symbols of the various instruments in the pictures correspond with those in the diagram (Fig. 2). The values of the various resistances, condensers, etc., are given in the list of parts. Note that self-adjusting rheostats (R5 and R6) are employed. The resistances R5 are of the ¼-ampere type for regulating the filaments of tubes V1. While ordinary 201-A type tubes are satisfactory, the Hi-Mu tubes designed especially for these amplifiers gave noticeably greater amplification. The filament resistance R6 is of the ½-ampere type, to regulate the UX-112 power tube (V2).

The voltages found to give best results in this amplifier are indicated at the binding post terminals in Fig. 2. The variable resistance, (R4) has a maximum resistance of 250,000 ohms. It is necessary to use one that does not heat up and change its resistance when the plate current passes through it.

The list of parts required for the amplifier of Fig. 2 only, with either resistance-coupling or choke-coil coupling, is given below for the information of constructors.

This amplifier unit may be connected to the detector output of any type of radio set. It works well when connected to the detector of the average 5-tube tuned-R.F. set; and a considerable improvement in the quality of reproduction is obtained, regardless of the type of speaker used. Although this amplifier requires a large number of "B" batteries, the current consumption is very

(*Continued on page* 585)

SYMBOL	QUANTITY	NAME OF PART	VALUE OF PART	REMARKS	MANUFACTURER*	
R1	2	Fixed Resistance	.1 meg.	For Resistance Amplifier	1	13,14,15,16
R2	1	Fixed Resistance	1/2 meg.	Grid Leak	1	17,19,20,21
R3	1	Fixed Resistance	1/4 meg.	Grid Leak	1	17,19,20,21,41
R4	1	Variable Resis.	250,000	For resistance amplifier	2	
C	2	Condenser	.1 mfd.	Bypass	3	19
R5	2	Ballast	1/4 amp.	Self adj. rheostat	4	22,1,14
R6	1	Ballast	1/2 amp.	Self adj. rheostat	4	22,1,14
SW	1	Filament Switch			5	13,23,24
V1	2	Vacuum Tube	High Mu		6	1,26
V2	1	Vacuum Tube	Power		7	25,26,1,12
	2	Panel Brackets			8	
	12	Binding Posts			9	28,29,30,31,32,33
	3	Sockets	UX		10	18,34,35,36,5,27,29,32
	1	Panel	7 X 14"	Bakelite		37
L	3	Chokecoil		For Choke Coil Amplifier	11	38,28,39,40,42

NUMBERS IN LAST COLUMN REFER TO CODE NUMBERS BELOW.

1 Daven Radio Corp.	13 Carter Radio Corp.	25 E.T. Cunningham	37 Bakelite Corp.
2 Allen-Bradley Co.	14 Electrad, Inc.	26 Supertron Mfg. Co.	38 Acme Apparatus Co.
3 Tobe-Deutschman	15 Central Radio Lab.	27 Bruno Radio Corp.	39 Dongan Elec. Mfg. Co.
4 Langbein-Kaufman Radio	16 American Mech. Lab.	28 General Radio Co.	40 Thordarson Elec. Mfg.
5 Cutler-Hammer Mfg. Co.	17 Aerovox Wireless Corp.	29 Kellogg Sw. & Supply	41 Arthur H. Lynch
6 C. E. Mfg. Co.	18 Auburn Button Works	30 Radio Specialty Co.	42 American Trans. Co.
7 Radio Corp. of America	19 Dubilier Cond. & Rdo.	31 DeJur Products Co.	43
8 American Radio Hdw. Co.	20 Intl. Resistance Co.	32 Hart & Hegeman Mfg. Co.	44
9 H. H. Eby Mfg. Co.	21 Wireless Prod. Corp.	33 Radio Panel & Parts	45
10 General Radio Co.	22 Radiall Co.	34 Alden Mfg. Co.	46
11 Samson Elec. Co.	23 Apco Mfg. Co.	35 Benjamin Elec. Mfg. Co.	47
12 Van Horne Co., Inc.	24 H. H. Frost	36 Bremer-Tully Mfg. Co.	48

APPROXIMATE COST OF PARTS $24.00

* THE FIGURES IN THE FIRST COLUMN OF MANUFACTURERS INDICATE THE MAKERS OF THE PARTS USED IN THE ORIGINAL EQUIPMENT DESCRIBED HERE.

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IMPORTANT NOTICE—*A Change in Policy*

WE recently conducted an investigation among our readers, and sent out a questionnaire to a large mailing list, in an effort to find out whether our readers desired us to name the makers of all materials that go into the sets built in RADIO NEWS laboratories.

The overwhelming number of affirmative answers which we received clearly indicated that our readers do wish to know the names of the manufacturers, but a very large percentage also voiced the desire to know alternate parts, in case it is not possible to secure the original parts themselves.

Accordingly, beginning with this issue, we have placed set building on an engineering basis, and are giving engineering specifications on all parts in such a way as to make it comparatively easy for any one to build the sets. If it is impossible to secure the exact parts with which the set was actually built in our laboratories, alternate parts are shown in our listings, which the engineers who originally built the set can recommend as well. Wherever it is physically impossible to list alternate parts, none will be shown.

We believe this new builders' engineering plan will solve a great many puzzling questions, and if you like this plan, we wish you would take the trouble to write us. If you wish it changed in any way, or have any other constructive criticisms, we shall be very glad to have them.

—EDITOR.

A Gang-Controlled Seven-Tube Receiver

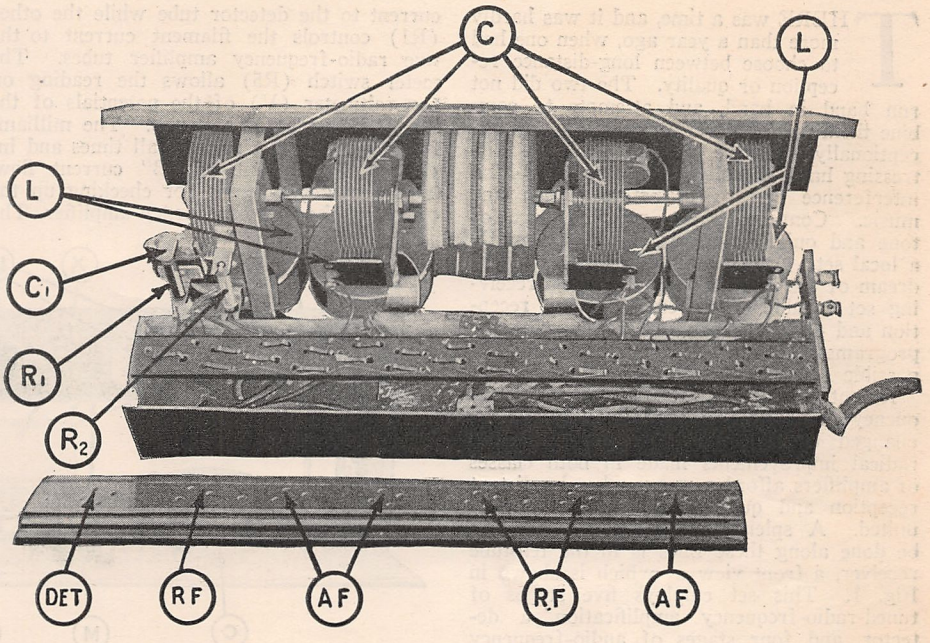
Finished Units Make Assembly Simple

By ANDREAS MAC GILLICUDDY

FOLLOWING the history of evolution in every industry which is of prime importance to civilization as a whole, radio is rapidly becoming more standardized. The manufacturers have come to realize that, in order to further the interests of the industry and for their common good, similar production standards must be adopted.

Take, for example, the tube situation. Think of the unspeakable chaos that would ensue if every maker of tubes used a different filament voltage or employed a different method of contact with the socket by which the tube is connected to the rest of the circuit. If the situation is given thought it will soon be realized that standardization is more than ever an integral part of radio.

Following this principle, there have been made available parts for a receiver which can be used in almost any circuit, but when assembled together result in a very excellent receiver. The parts in this case are a gang-controlled condenser, a series of radio-frequency transformers, and an audio amplifier of the latest type. In the ordinary receiver employing seven tubes economy of space is given little consideration, but in the receiver shown in the accompanying illustrations it will be seen that there is no waste space whatsoever.



The rear view of the receiver. The bakelite strip in which the vacuum tubes are placed fits over the A.F. amplifier, from which the battery cable at the right projects.

SIMPLIFIED SOCKET ARRANGEMENT

Take the matter of the tube sockets used in the general run of receivers; these sockets are anywhere from 1½ to 2 inches across and even if they are placed so close that they are touching, seven of them take up considerable room on a sub-panel or baseboard.

SYMBOL	QUANTITY	NAME OF PART	VALUE OF PART	REMARKS	MANUFACTURER*	
L	4	Shielded Coils		R. F. Transformers	1	
C	1	Gang Condenser	.000375Mf	4-Condenser Unit	2	12
	1	3 stage amplifier		Consisting of 3 units	2	
R	2	Rheostat			4	13,10,14
C1	1	Fixed Condenser	.00025 Mf	Grid Condenser with mount.	5	11,15,16,17
C2	1	Fixed Condenser	.0005 Mf		5	11,15,16,17
C3	1	Fixed Condenser	.001 Mf		5	11,15,16,17
C4	1	Fixed Condenser	.2 Mf	By-pass	5	11,15,16,17
R1	1	Grid Leak	2 meg.		6	11,18,9,7
	1	Grid Leak Mount.			7	9,11,18,6
S	1	Switch		For filament circuit	10	19,20,14
	4	Vacuum tubes	Type 201A		8	21,9,22,23
	1	Vacuum tubes	Type 200A		8	21,9,22,23
	1	Vacuum tubes	High Mu	For Audio Amplifier	9	21,22,23,9
	1	Vacuum tubes	Type 171	Power Amplifier	8	21,9,22,23
	6	Vacuum tubes	Type 199	Alternatives	8	21,9,22,23
	1	Vacuum tubes	Type 120	Alternative	8	21,9,22,23
	1	Panel	16"X5"	Wooden or Bakelite		
	1	Panel	16"X2½"	Wooden or Bakelite		
	1	Strip	4"X3/4"	Bakelite for binding posts		
	2	Binding Posts			24	
	2	Phone Tip Jacks			20	25
R2	1	Resistor	25,000ohm		11	20,4,13

NUMBERS IN LAST COLUMN REFER TO CODE NUMBERS BELOW.

1 F. W. Sickles Co.	13 DeJur Products	25 Union Radio Corp.	37
2 Alden Mfg. Co.	14 Saturn Mfg. & Sales Co	26	38
3 Samson Elec. Co.	15 Micamold Radio Corp.	27	39
4 Allen Bradley Mfg. Co.	16 Sangamo Elec. Co.	28	40
5 Dubilier Cond. & Radio	17 Tobe-Deutschman	29	41
6 Micamold Radio Corp.	18 Arthur Lynch, Inc.	30	42
7 Langbein Kaufman Co.	19 Yaxley Mfg. Co.	31	43
8 Radio Corp. of America	20 Carter Radio Co.	32	44
9 Daven Radio Corp.	21 Cunningham Company	33	45
10 Cutler-Hammer Mfg. Co.	22 Cleartron Vac. Tube Co	34	46
11 Electrad, Inc.	23 C. E. Mfg. Co.	35	47
12 Bruno Radio Corp.	24 X L Radio Labs.	36	48

APPROXIMATE COST OF PARTS $70.00

* THE FIGURES IN THE FIRST COLUMN OF MANUFACTURERS INDICATE THE MAKERS OF THE PARTS USED IN THE ORIGINAL EQUIPMENT DESCRIBED HERE.

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Now notice the bakelite strip lying in front of the receiver in the rear view of the set illustrated. It will be seen that there are twenty-eight holes, arranged in series of four. These are the holes through which the prongs of the tubes pass to connect their elements to the rest of the circuit. The metal contacts for the prongs of the tubes are incorporated in the construction of the audio amplifier.

How then, it might be asked, can the radio-frequency tubes be used, when the sockets are so placed? Nothing simpler. Wires run from these contacts to the various coils and condensers which form the R.F. amplifier, and the set builder has merely to solder these wires to their proper points of contact. This is very much easier than wiring up an ordinary receiver of the same number of tubes; especially because three of the sockets are already connected inside the audio-frequency amplifier.

THE A.F. AMPLIFIER

The audio-frequency amplifier (which has been described in detail in the June and October issues of RADIO NEWS), is of special interest, because its reproduction is of the highest order. The outstanding features of this amplifier include a very fine frequency-characteristic, freedom from the tendency to overload, and higher amplification than can otherwise be generally obtained without a sacrifice of quality.

The coupling device used in this amplifier comprises two coils mounted on a single rectangular core, each of the windings having the same number of turns. The coupling is further assisted by the coupling condenser, connected between the plate and grid terminals of the coils. A leakage path for the grid charges is furnished by the low-resistance winding on the output side of the coupling device. It is this that prevents overloading of the amplifier and consequent distortion.

As mentioned above, this amplifier is built in the form of a complete unit; all the connections to the three audio-frequency-

(*Continued on page 609*)

A Ten-Tube Receiver of Advanced Design

An "All Wave" Set with a 5-Stage Radio-Frequency-Amplifier

By H. B. WIFFEN

THERE was a time, and it was hardly more than a year ago, when one had to choose between long-distance reception or quality. The two did not run hand in hand, and attempts to combine them were not very successful. An exceptionally sensitive receiver had the distressing habit of collecting all sorts of local interference and of distorting speech and music. Conversely, the receiver pure of tone and quiet in operation was inherently a local set. And it was sad to note that the dream of the average radio fan, of a receiving set capable of extremely distant reception and equally capable of reproducing the programs in a faithful manner, seemed impossible of realization.

Recent advances in radio- and audio-frequency amplification arrangements have changed entirely the whole aspect. The radical improvements made in both classes of amplifiers afford a means whereby distant reception and quality reproduction can be united. A splendid example of what can be done along these lines is in the ten-tube receiver, a front view of which is shown in Fig. 1. This set employs five stages of tuned-radio-frequency amplification, a detector, and four stages of audio-frequency amplification, a combination heretofore unaccomplished. Yet, with this large number of radio- and audio-frequency stages, there are but two main controls; one tuning the aerial circuit and the other tuning the radio-frequency amplifiers, C and C1 respectively in Fig. 1.

SIMPLICITY OF CONTROL

There are a few convenient auxiliary controls on the front of the panel. A selectivity switch (S) provides means of increasing or decreasing the damping of the aerial circuit, thus making this input stage either broad or sharp in tuning, as found desirable. One rheostat knob (R) controls the filament current to the detector tube while the other (R1) controls the filament current to the five radio-frequency amplifier tubes. The meter switch (R5) allows the reading on the voltmeter (V) of the potentials of the "A", "B" and "C" batteries. The milliammeter (M) is in circuit at all times and indicates the amount of "B" current flow. This provides a means for checking up the output of the audio-frequency amplifier. The two jacks at the lower right corner of the panel are in the audio-frequency-amplifier circuit, as will be noted in the circuit diagram, Fig. 3; the first is in the output circuit of the third-stage amplifier, the second in the output circuit of the fourth-stage or power amplifier.

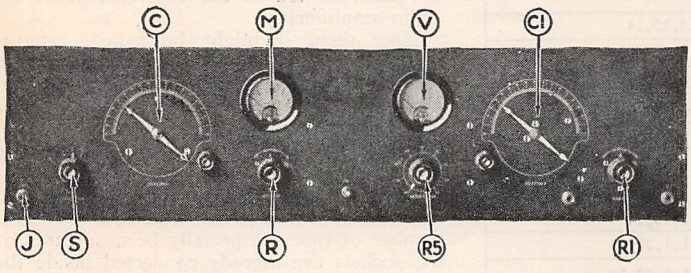


Fig. 1. Front view of the ten-tube receiver, C and C1 are the tuning controls. The selectivity of the aerial circuit can be increased or decreased at will through the use of switch S. A loop aerial can be used by plugging it into jack J.

RADIO-FREQUENCY AMPLIFIER

A top view of the set is illustrated in Fig. 2. The aerial inductance (L) and the five radio-frequency transformers (L1) are mounted on the narrow sub-base at right angles to each other. These inductances are of the plug-in type and, with five sets of them, all wavelengths from 35 to 3600 meters can be covered; the set most frequently used covers the range from 200 to 560 meters. All of these coils are space-wound and, in order to obtain a high degree of selectivity and stability, the coupling between the primaries and secondaries has been made comparatively loose. This precludes the chance of interaction between the radio-frequency circuits.

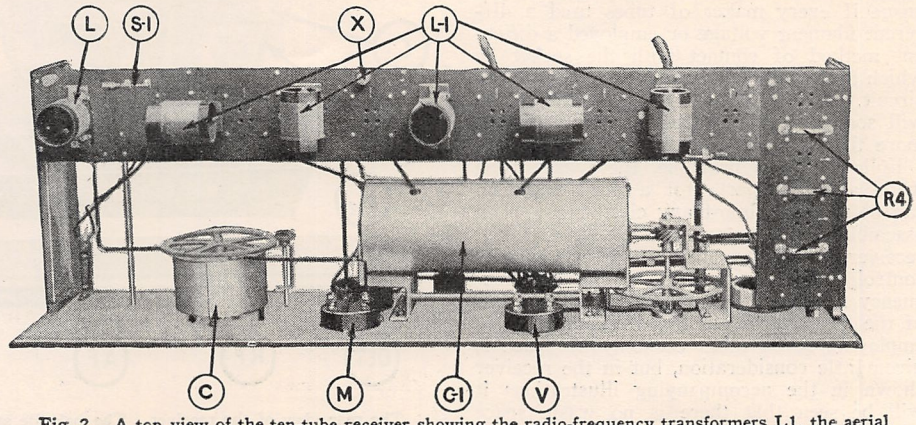


Fig. 2. A top view of the ten-tube receiver showing the radio-frequency transformers L1, the aerial tuning condenser C and the R.F. tuning condenser unit C1. The R.F. transformers are of the Plug-in type, so that wave bands from 35 to 3600 meters can be covered.
Photographs courtesy of Norden-Hauck, Inc.

To tune each of these five radio-frequency stages and the detector circuit simultaneously a special five-section variable condenser (C1), has been developed. The entire unit, as well as each of its individual sections, is completely shielded. The stator plates are all soldered together, to decrease the resistance in the circuits to the lowest possible amount. The five gangs of rotors are mounted on a single shaft, which is geared to the right-hand tuning control on the panel. The entire condenser unit is adjusted to a standard so that the capacity variation at any point on the tuning scale does not exceed 1½ micro-microfarads, from the highest to the lowest setting; thus an accuracy in the order of ¼ of 1 per cent. of the maximum capacity is obtained.

A special system of stabilization employing capacities and resistances (C2 and R2 in the circuit diagram, Fig. 3.) in the radio-frequency stages is one of the important factors of the circuit. Without this ar-

(*Continued on page* 564)

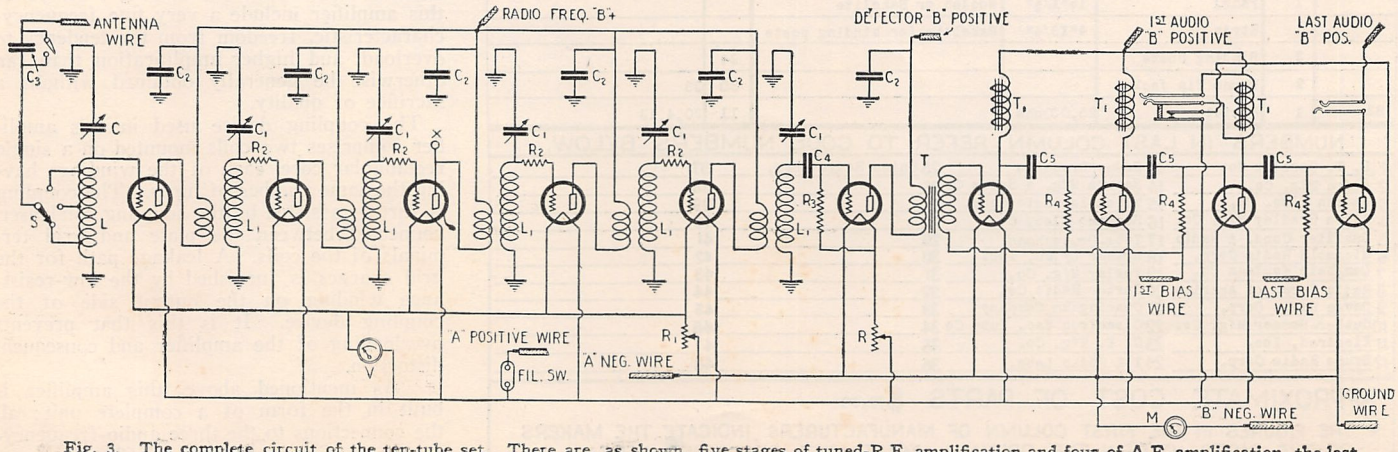
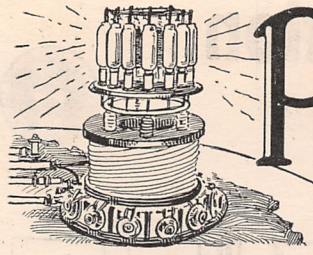
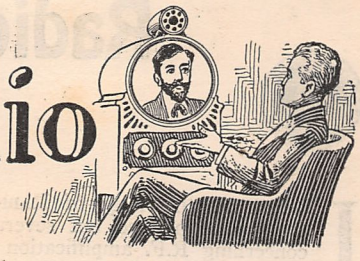


Fig. 3. The complete circuit of the ten-tube set. There are, as shown, five stages of tuned-R.F. amplification and four of A.F. amplification, the last three being of the impedance-coupled type. Condensers C2 and resistances R2 form the stabilizing circuits.

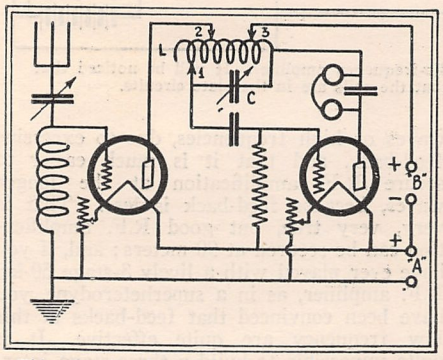


Progress in Radio



THE ABÉLÉ CIRCUIT

The circuit shown here is held in high esteem amongst French amateurs. It was originally designed by Mons. J. Abélé, an officer of the French Signal Corps, who developed it from the so-called "type C" receiver used during the later months of the war.



This circuit, the Abele, is worth trying. It has many good points.

At first sight it appears to be very similar to an ordinary tuned-plate radio-frequency amplifier; but a closer examination brings out several features of distinction. Actually the circuit combines amplification due to the resonant properties of the tuned inter-tube circuit, LC, with amplification obtained by a direct back-coupling between the grid and the plate circuits of the second tube.

The plate circuit of the first tube includes only the portion of the tuned coil L between the adjustable tapping points 2, 3. This gives a step-up voltage effect, the coil acting as an auto-transformer. The grid connection to the second tube is taken from the outside tapping 1 at the farthest point from the plate terminal of the same tube.

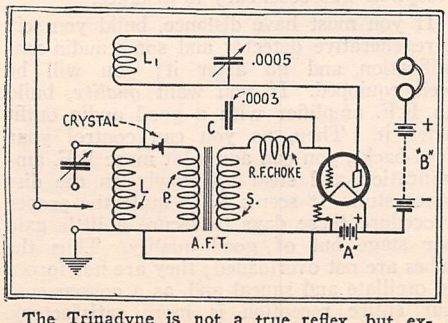
As the output current from the detector plate passes through that part of the coil L branched by the tapping 3, there is a direct back-coupling between the plate and grid circuits of the detector tube, the strength of which is determined by the position of the tap 3.

—*Popular Wireless.*

THE TRINADYNE CIRCUIT

There comes from England the circuit shown in the accompanying diagram, which at first glance might appear to be a common type of reflex. Such is not the case. It will be noted that there is the usual tuned aerial circuit with a series antenna condenser and a crystal rectifier. This is followed by a conventional one-stage transformer-coupled vacuum-tube amplifier.

Up to this point everything is quite normal; but regeneration is introduced by the addition of a tickler coil L1 in the plate circuit of the vacuum tube, which is coupled to the antenna inductance L. A portion of the radio-frequency current is impressed on the grid of the vacuum tube, finding ready passage through the fixed condenser C. It is amplified by the tube and fed back to L through L1. The R.F. choke prevents the passage of the radio-frequency currents through the secondary winding of the audio transformer, where they would meet ground potential.



The Trinadyne is not a true reflex, but extra amplification is obtained.

A BATTERYLESS RECEIVER CIRCUIT

Endeavors along the line of battery elimination have been directed chiefly toward converting the A.C. cycle to a pulsating direct current, and then, by reduction of the pulsations, to approximating battery characteristics as nearly as possible. With the new system described here, which has been designed by Francis R. Hoyt, a consulting engineer, the developments of the past have been set aside, and raw A.C. current is supplied to the filaments of all of the tubes, including the detector practice heretofore considered almost impossible.

The circuit wiring diagram shows an application of this new principle to a five-tube tuned-radio-frequency receiver. In this diagram the A.C. driving unit is indicated as the windings 1, 2, 3 and 4; No. 1, as shown, is the A.C. input; No. 2 furnishes the plate voltage, through the half-wave rectifier connected to one of its terminals; No. 3 supplies the filaments of all of the receiving tubes, while No. 4 delivers the heating current for the rectifier.

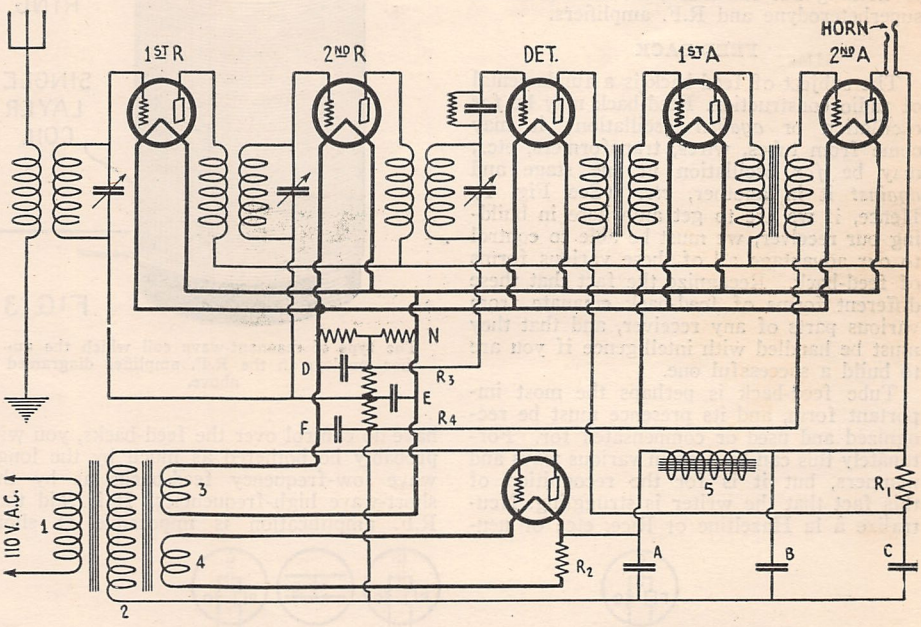
The grid circuits of all of the tubes, as well as the negative plate lead, return to the nodal point of the non-inductive resistance N. Grid potentials, of the proper value for the various tubes, are secured through the voltage drop in the inductive resistances R3, R4. Radio-frequency currents are by-passed by the condensers D, E and F.

Through the arrangement of the grid returns with respect to the half-wave plate-current circuit, the grids are caused to "wobble" with the plate-current variations resulting from the irregularities in emission. In this way all noticeable "hum" is eliminated, and speech ripples avoided.

ANOTHER "SUPER" CIRCUIT

This invention, which is by Captain Claude Seymour, R. N., and James Clarence William Drabble, both of H.M. Signal School, R.M. Barracks, Portsmouth, England, applies particularly to great amplification of radio-frequency currents.

The receiving circuit shown in the illustration as variably coupled to the aerial coil 1 comprises a divided circuit L1, C1, L2 C2,



A batteryless receiver circuit. By the clever arrangement of divided circuits the grids of the tubes are caused to "wobble" with the plate current variations thus eliminating the hum.

tuned to the incoming signal. It is not essential that the tuned circuit should be coupled to an aerial circuit or that the coupling should be variable, as coil windings L1, L2, of the divided circuit itself may be used as a kind of loop aerial. (In such case the coils should preferably be of large diameter.)

The aerial circuit itself may be tuned or aperiodic, and may be grounded or not. Variable condenser C1 which is used for tuning the divided circuit L1-C1, L2-C2, may in some cases be omitted—as, for instance, for very high frequencies, in which case the internal capacity of the tube X

(*Continued on page* 588)

Radio-Frequency Amplification

Resonant-Wave Coils as R.F. Transformers

By EDMUND T. FLEWELLING

IN last month's issue of RADIO NEWS, the writer pointed out several things concerning R.F. amplification that appealed to him as being rather important ones from several angles. The will and desire to lay sufficient stress on the points taken up in that article were there, but the ability to do so was perhaps rather lacking. For this reason he has chosen to continue in this article with the same line of thought, secure in the hope that any limitations as a writer may be overcome by attacking the subject from other angles.

Last month's article told about the absurdities contained in the thousand and one hook-up articles that have been and are being published. The writer himself has produced several hook-up articles; so he must class his own with the thousand and one. Most of these articles give the wiring diagram, a photograph of the set, and a list of the required parts—and assume that the reader will secure the desired results. Experiences as a consultant have very clearly proven that more than one commercial manufacturer might profitably heed the facts brought out in last month's article; but the article was written of course mainly for the benefit of the set builder who "rolls his own." Letters galore from ardent fans, who depend upon current articles for their information, are the reason for trying to put over in these articles the lessons taught by bitter experience; such for instance as one year devoted to nothing but constructional details of the superheterodyne and R.F. amplifiers.

FEED-BACK

The subject of feed-back is a fundamental of radio construction. Feed-back may be *for* oscillation or *against* oscillation; it may come from tubes, wires, transformers, etc.; may be *for* oscillation in one stage and *against* it in another, *etc.* (See Fig. 1) Hence, if we are to get anywhere in building our receiver, we must be able to control to our advantage all of these various forms of feed-back. Recognize the fact that these different forms of feed-back emanate from various parts of any receiver, and that they must be handled with intelligence if you are to build a successful one.

Tube feed-back is perhaps the most important form, and its presence must be recognized and used or compensated for. Fortunately this can be done in various ways and manners, but it is for the recognition of this fact that the writer is struggling. Neutralize à la Hazeltine or Rice, etc., or neutralize by means of the *location* of your apparatus or wiring; but *neutralize the tube feed-back.* You must if you are to get any kind of a return from your tubes.

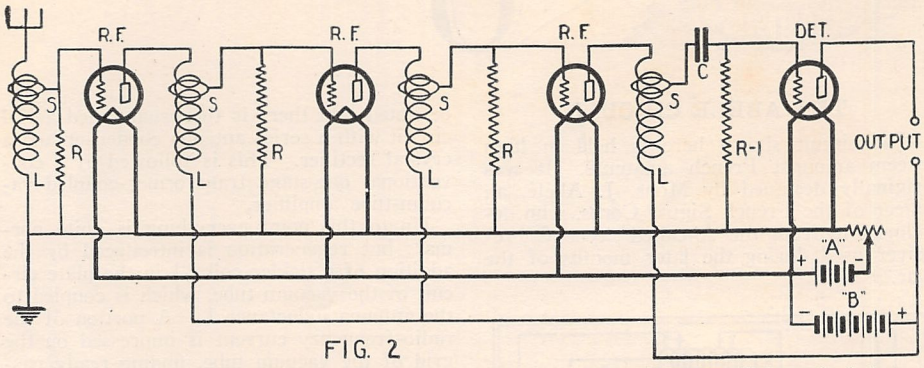


FIG. 2

Here coils like that shown below are used in a radio-frequency amplifier. It will be noticed that no variable condensers are employed and that the coils are in the plate circuits.

Do not be misled by the varying feed-back effects with long or short waves. If you have no control over the feed-backs, you will probably be bothered as much by the long-wave low-frequency feed-backs as by the short-wave high-frequencies. It is said that R.F. amplification is impossible at short waves or high frequencies, due to excessive feed-back, and that it is much easier to secure R.F. amplification at the longer waves, because feed-back is less. That is very, very true, but good R.F. amplification can be secured at 90 meters; and, if you have ever played with a lively 3-stage 50-kc. R.F. amplifier, as in a superheterodyne, you have been convinced that feed-backs at this low frequency are quite effective. It is quite impossible to build a three-stage intermediate amplifier, to operate in the 40- to 50-kc. range, that is worth the name—unless some means are taken to neutralize the various feed-backs; and this doesn't mean a potentiometer, either. Moreover this applies to any popular available type of intermediate transformer.

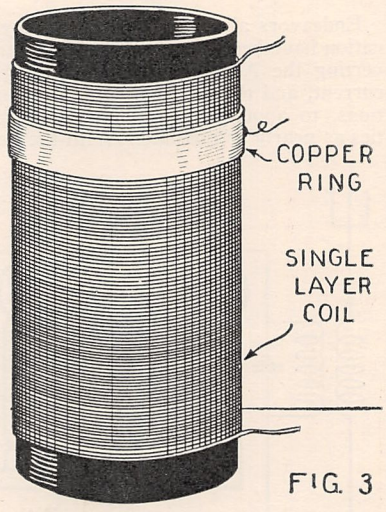


FIG. 3

The type of resonant-wave coil which the author employs in the R.F. amplifier diagramed above.

If you can read between the lines here you will purchase for your next intermediate transformers only such as have a tap for neutralizing, or two-range transformers, where the tap for the higher wave may be used for neutralizing. All popular hook-ups call for three intermediate stages, when two stages of properly neutralized intermediate will run rings around them. This is the writer's answer to many, many inquiries from New York to Cape Town (South Africa) as to what intermediate transformers to use.

Go beyond your tube feed-back and conquer the feed-backs from coils, condensers and wiring and then you can feel that you have a real radio receiver.

SMALL GAIN PER STAGE AN ADVANTAGE

Quality of reception is the important thing in a receiver and, unless your R.F. amplifier is stable, as by proper neutralization, you have not even started toward that goal. We are all inclined to seek the marvelous hook-up that gives loud-speaker operation on one or two tubes. That was all right in days gone by when tubes cost a lot and quality of reception was secondary to distance.

If you must have distance, build yourself a regenerative detector and some audio amplification and go after it; you will be well equipped. If you want *quality,* build an R.F. amplifier with a good audio outfit after it. Then, as you can control your feed-backs, you can add a bit more R.F. amplification and steal up slowly on the distance stuff. It seems to be quite the proper procedure these days to secure a little gain per stage but of good quality. Thus the tubes are not overloaded; they are not forced to oscillate and squeal and, as a consequence our entire reception is more satisfactory.

(*Continued on page* 566)

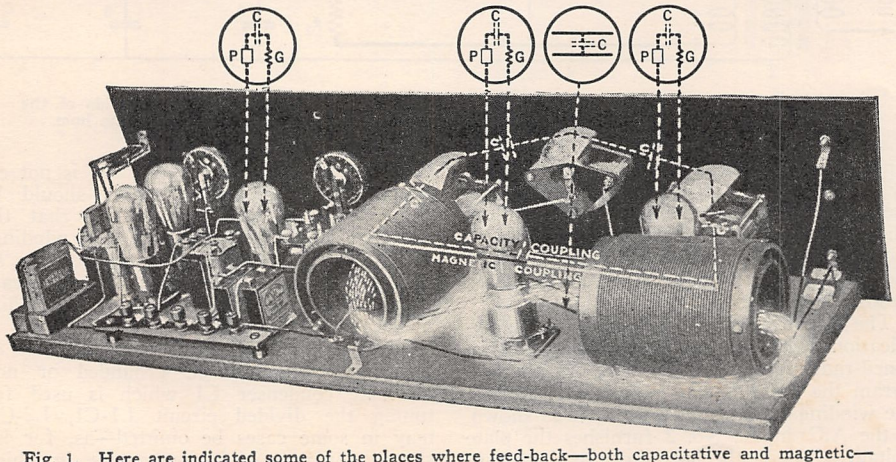


Fig. 1. Here are indicated some of the places where feed-back—both capacitative and magnetic—may occur in a receiver. Theoretically, there is some form of coupling between the three variable condensers and the two coils, as shown by the full and dotted lines. Capacity-coupling in the tubes is indicated by the condenser-cymbol C.

Transformer-Coupled Amplifiers

An Analysis of the Operation of a Transformer

By SYLVAN HARRIS

BEFORE we go ahead with this article let us recapitulate what has gone before. This series of articles began with a general discussion of the nature of music, analyzing the relations between pitch and frequency, fundamentals and overtones and the effect of the overtones or harmonics on the quality or "timbre" of the musical sounds emitted from the various musical instruments. It was shown how the introduction of spurious frequencies into these sounds or the loss of any of the overtones affects the timbre of the sound, when reproduced by an audio amplifier.

Other articles pointed out some of the difficulties that are met in the design and operation of audio amplifiers, and from the practical viewpoint, what is required of an amplifier in order that it may reproduce faithfully the sounds, musical or otherwise, which go into it. After that we studied some of the effects of overloading the amplifier upon the reproduction, and some of the inherent characteristics of electron-tube circuits which influence this overloading. The preceding article took up the structural study of the amplifier, showing how the various arrangements of amplifiers closely resemble each other, both in structure and operating characteristics; this will be devoted to the analysis of the several types of amplifiers separately.

We shall begin with the type of amplifier that is in most general use at the present time—the transformer-coupled amplifier. Its structure in schematic diagram form is shown in Fig. 1, while Fig. 2 pictures a "bread-board layout" of this type of amplifier. The operation of the amplifier is well understood; the electrical impulses to be amplified are impressed upon the amplifier at the *input* terminals, while those which are to actuate the loud-speaker emanate from the *output* terminals. Between the input and output terminals of the amplifier we desire to have the various components of the electrical impulses—whether they arise from music or otherwise, whether they be pleasant to the ear or not—amplified *in the same ratio, regardless of frequency or amplitude*. This has been brought out in the previous articles.

THEORY OF THE COUPLING

For our present purpose, let us consider Fig. 3, which represents a portion of an audio amplifier utilizing transformer coupling. We will consider mainly the transformer itself, in connection with its *terminal impedances*, by which we mean the impedances, resistances, or what-not, which are connected to the primary and secondary windings of the transformer. An alternating voltage V, due to the impulses to be amplified, is impressed on the grid or input circuit of the first tube. This voltage V is amplified in the tube, giving rise to an alternating voltage V_1 in the plate circuit of the first tube, having the same wave-form and frequency. We will assume that the alternating voltage established in the plate circuit of the first tube is an exact reproduction of the alternating voltage, V, put into it, but *magnified*. This is not exactly true, for the tube may contribute a little toward distorting the signals; but since we are not primarily studying tubes we will omit this source of distortion for the present.

We, therefore, are starting out with an alternating voltage in the plate circuit of the first tube, which is represented by V_1 in Fig. 4. Now, the path which the electrons take in the first tube, in their course from the filament to the plate, has a certain resistance, known as the plate resistance of the tube; and this resistance, which is considered as in series with the load external to the tube, is represented as r_p in Fig. 4. Connected in series with this is the primary of the transformer.

In Fig. 3 the secondary of the transformer is shown connected to the input or grid circuit of the second tube. It was shown in the previous article that the input of an electron tube represents a certain load on the transformer. This load is *a resistance in series with a capacity*, as indicated in Fig. 4, by C_g and r_g. In the ideal amplifier, the input of the electron tube should have infinite impedance; that is, the resistance r_g would be infinite, or the capacity C_g be zero, or both. Actually, this is not the case, as shown in the preceding articles; and for our purpose we shall represent the input of the second tube as a resistance load on the secondary of the transformer, designated by r_g in Fig. 4A, and having impressed upon it the secondary voltage V_2.

For a given input voltage V_1 we wish this secondary terminal voltage V_2 to be as high as possible, without introducing distortion. In other words, we wish the ratio of V_2 to V_1, which is the voltage ratio of the system, to be as high as possible. This is the circuit of the transformer which we are to study.

(*Continued on page* 594)

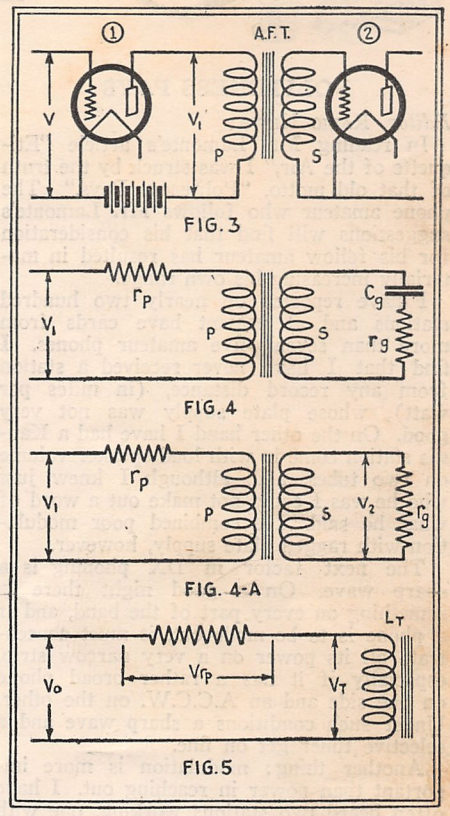


FIG. 3

FIG. 4

FIG. 4-A

FIG. 5

These four figures illustrate the theory of the operation of transformers in audio-frequency amplifiers. See the accompanying text for explanation.

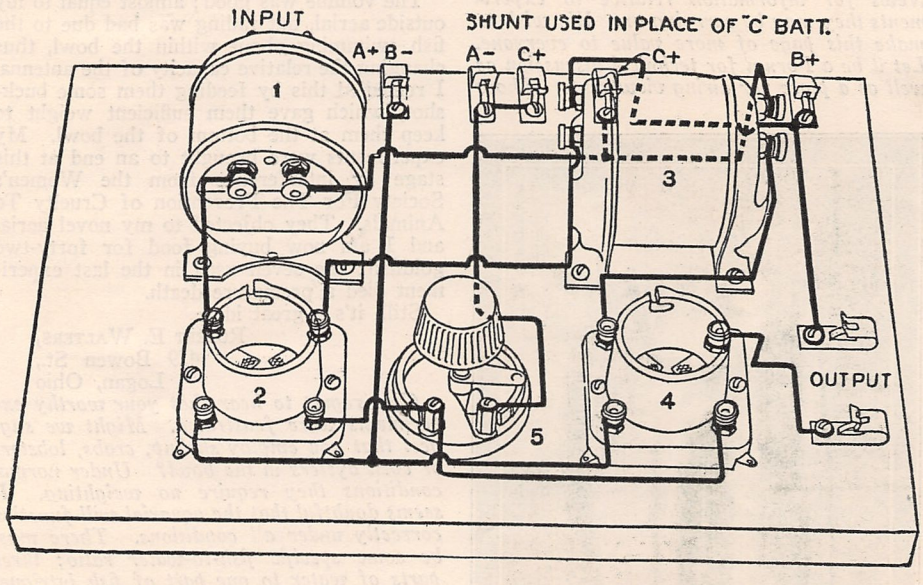


Fig. 2 (above) shows an excellent arrangement for the apparatus in an audio amplifier of the transformer-coupled type.

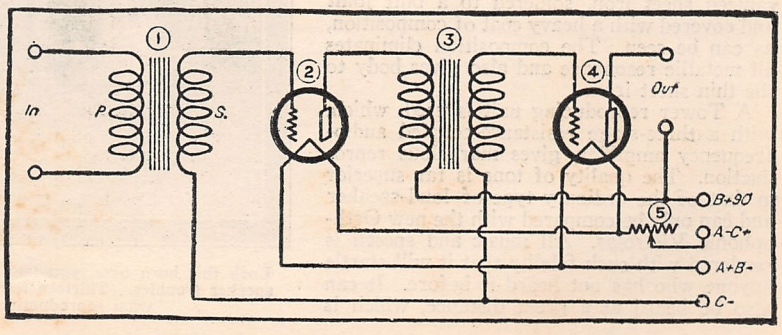


Fig. 1 (at the right) is the circuit diagram of the transformer-coupled A.F. amplifier, showing schematically the various battery connections illustrated in Fig. 2.

POLITENESS PAYS

Editor, RADIO NEWS:

In reading Mr. Lamonte's article "Etiquette of the Air," I was struck by the truth of that old motto, "Politeness Pays." The phone amateur who follows Mr. Lamonte's suggestions will find that his consideration for his fellow amateur has resulted in materially increasing his own range.

I have reported on nearly two hundred stations and at present have cards from more than seventy-five amateur phones. I find that I have never received a station from any record distance, (in miles per watt), whose plate supply was not very good. On the other hand I have had a Kansas station come in with loud speaker volume on two tubes, and, although I knew just who he was I could not make out a word of what he said. He combined poor modulation with ragged plate supply, however.

The next factor in DX phoning is a sharp wave. On a good night there is something on every part of the band, and if a phone is to be made out, it must concentrate all its power on a very narrow strip, especially if it has a rather broad phone on one side and an A.C.C.W. on the other. Under such conditions a sharp wave and a selective tuner get on fine.

Another thing: modulation is more important than power in reaching out. I have often heard two stations working, one with only a fraction of the volume of the other, yet have been able to hear distinctly every word from the weaker station, and about 50 per cent. from the stronger. It is foolish to increase the power if the modulation is not excellent; as money spent in improving modulation will be many times as effective.

Do not think I am in the least prejudiced in any way by ham interference. I do not think there is a ham-fone within two hundred miles of me at the present time, and no one is freer from jamming than I am. All the above suggestions are made purely with the hope of helping to increase the efficiency and range of amateur phones.

PHONE HOUND,
Crane Valley, Saskatchewan.

A THIRTEEN-FOOT LOUD-SPEAKER HORN

Editor, RADIO NEWS:

Herewith is a photograph of a loud-speaker horn which I have built from data given in the article by Major J. S. Hatcher, "The Passing of Canned Music," in the April, 1926, issue of RADIO NEWS.

The horn measures over thirteen feet in length and is 5½ feet in height. It is ⅝-inch in diameter at the small end, and 15 inches across the flare. The horn is built of galvanized sheet iron, soldered to a butt joint and covered with a heavy coat of composition, as can be seen. The composition eliminates all metallic resonance and also gives body to the thin sheet iron.

A Tower reproducing unit is used, which, with a three-stage resistance-coupled audio-frequency amplifier, gives marvelous reproduction. The quality of tone is far superior to that of the ordinary type of loud-speaker and can only be compared with the new Orthophonic Victrolas. All music and speech is rendered with such fidelity that it will startle anyone who has not heard it before. It can also be heard at a great distance, which is probably due to the large column of air set in motion.

EDWIN E. KRUMRIE,
886 15th Ave., Milwaukee, Wis.

THANK YOU

Editor, RADIO NEWS:

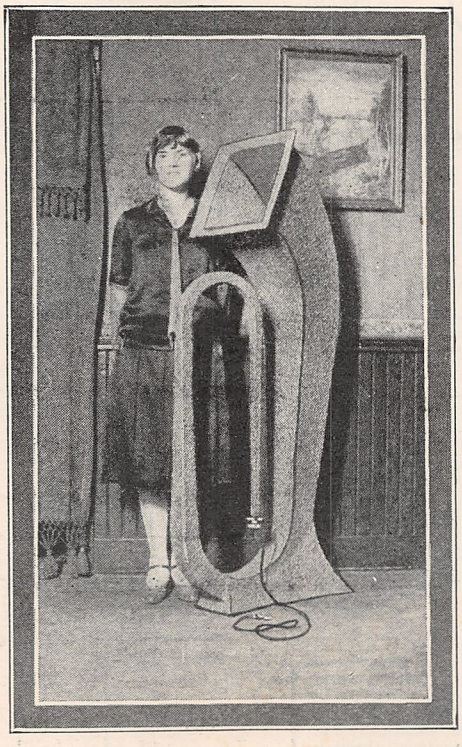
Please permit a grateful home experimenter to express his thanks for benefits received from RADIO NEWS.

I doubt whether we home-working, sun-dodging experimenters accomplish much in the field, compared to the regular laboratory worker; but we do have a lot of innocent pleasure and some profit from our work, which would, for me, be nearly impossible without RADIO NEWS. Here's why: The home worker usually has neither equipment or money and often not the brains to work out the mathematical data and formulae that are so necessary to intelligent and efficient experimenting. RADIO NEWS is the only magazine I know of that supplies these requisites in non-technical language.

I also wish to praise the clear, easily-read schematic diagrams in RADIO NEWS. If you don't get what I mean look at the work of some of your worthy contemporaries. In all, I receive three times as much for my money in RADIO NEWS as from any other radio periodical.

HOMER T. RICHARDSON,
Box 321, Canyon, Texas

(Which prompts us to state that we wish our readers to feel that they are at liberty to call upon the Technical Staff of Radio News for information relative to experiments they may be carrying on. We wish to make this page of more value to everyone. Let it be a Forum for technical discussion as well as a place for airing viewpoints. Those letters lacking sufficient general interest will be referred to the I Want To Know Department. What is on your mind?)



Look this horn over, you fans who have loud-speaker troubles. Thirteen feet long and—my, what reproduction!

MORE "AQUARIAL" EXPERIMENTS

Editor, RADIO NEWS:

Having read Mrs. J. W. Cherbonneaux's letter in the August issue of RADIO NEWS, which described a novel submerged antenna in the form of a big fish bowl, with seven goldfish contained therein, I was somewhat skeptical as to the results and decided to try the experiment.

Not having any fish or any bowl, I was forced to procure these articles at a considerable outlay of loose change.

In order to make the experiment decisive, I purchased seven different sized bowls and forty-nine assorted goldfish.

My first experiment consisted of placing seven of the largest fish in the largest bowl full of water, submerging a wire in said water and connecting it to the aerial post of my eight-tube superheterodyne receiver. The ground was connected in the usual manner.

The results were indeed surprising. The static entirely disappeared; but to my astonishment I could not tune any lower than six hundred meters, even by introducing a condenser in series with the "aerial." I decided that the seven large goldfish offered too much capacity and accordingly substituted seven medium sized fish, which enabled me to tune down to the broadcast wavelengths.

The volume was good; almost equal to my outside aerial, but fading was bad due to the fish swimming about within the bowl, thus changing the relative capacity of the antenna. I remedied this by feeding them some buckshot, which gave them sufficient weight to keep them at the bottom of the bowl. My experiments were brought to an end at this stage by interference from the Women's Society For The Prevention of Cruelty To Animals. They objected to my novel aerial and I am now buying food for forty-two goldfish; the seven used in the last experiment died a premature death.

Still, it's a great idea.

ROBERT E. WALTERS,
429 Bowen St.,
Logan, Ohio

(We regret to hear that your worthy experiments were frustrated. Might we suggest that you employ shrimp, crabs, lobsters or even oysters in the bowl? Under normal conditions they require no weighting. It seems doubtful that the aquarial will function correctly under all conditions. There must be some specific fish-to-water ratio; three parts of water to one part of fish intrigues us. At any rate, you should be able to get along with one bowl by increasing or decreasing the volume of one or the other. The addition of alcohol to decrease the specific gravity of the water might prove interesting, if not devastating.)

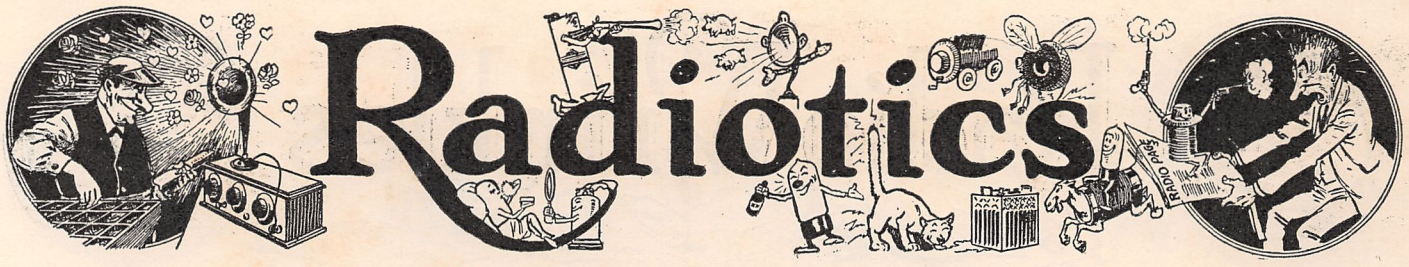
THE "EXPERIMENTER'S SET"

Editor, RADIO NEWS:

I have just completed the four-tube radio set described in the April, 1926, issue of RADIO NEWS under the title, "The Experimenter's Own Tuned R.F. Set."

The first night I was able to tune in on

(*Continued on page* 532)

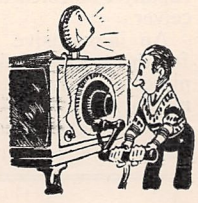


TOUGH LUCK, LUTHER!

Popular sporting event reported by the *Cleveland News-Leader* of August 15: "One of the stars of the past week's broadcasts in Cleveland was Luther Jackson, who SANK at WTAM Monday night." Apparently these ether waves are a lot harder to swim against than the English Channel.

Contributed by
H. K. Jones.

JUST ONE MORE CONTROL



New adjustments for radio receivers announced by the *Radio World* of Aug. 21 (advertising section): "5-ply Walnut VERNIER Piano Finish Cabinet." No, Oswald, I can't get your bed-time story if you will persist in turning the walnut vernier. It changes the *finish* of the program.

Contributed by
Joel H. Dearth

RIDE 'EM, COWBOY!

Program forecast in the *Nampa, Idaho Free Press*, Aug. 13: "Cowboys from Montana, Oklahoma, Texas and New Mexico . . . are here to take part in Chicago's wild west RADIO . . ." We suppose that the stations in the Windy City have a special brand of wild ether waves for the boys from the West to ride over.

Contributed by
James L. Young

HOW SCIENCE DO ADVANCE

Another obnoxious by-product converted to something useful, as told in the *New York Sun* of Aug. 21: "The 'B' eliminator illustrated utilizes a TUNE for rectifying purposes . . ." If an eliminator simply must hum, we prefer that it should hum a tune. It would be a cure for that tired feeling when DX just ain't.

Contributed by
Chas. G. Coombs

DAT'S WHERE MA MONEY GOES

The Radio Four of WGY recently put on the air an Old Song Program, and in telling about it the *Radio World* of Aug. 21 said that "The QUARTER sang, 'Billy,' 'Just a Baby's Prayer at Twilight.' . . ." Have you heard the expression "Money Talks?" Well, dar she am.

Contributed by
Dale Phillips

SOUNDS ALMOST GOOD TO EAT

Advertisement in the classified columns of the *Lincoln, Nebraska State Journal* of Aug. 15: "Five-tube Thompson radio-NU-TRODIVE for sale cheap." Whether this thing grows on trees from the front part of its name or whether it dives into the ether waves is something that we would like to find out.

Contributed by
A. L. Henrikson

SOUNDS LIKE FLORIDA REAL ESTATE

Indication of the change of the times in the *Boston Post* of Aug. 5: ". . . the directional loop consisting of several turns of wire on a FARM four or five feet square is used." After much research, Mike of our Investigation Department announced that the wire is used for fences around this farm. We were disappointed.

Contributed by
Allen E. Dudley

WHAT THE WELL-DRESSED FAN WILL WEAR

Fashion advertisement in the *Boston Globe* for July 27: "437 Women's Summer Dresses, $3.75, each. All of standard manufacture. Panels, switches, sockets, rheostats, coils, condensers, transformers, panel shields, resistances, micadons, etc. The reductions are enormous. Women's Economy Dress Store—2nd floor." What can we add?

Contributed by
G. E. Thompson

IF you happen to see any humorous misprints in the press we shall be glad to have you clip them out and send to us. No RADIOTIC will be accepted unless the printed original giving the name of the newspaper or magazine is submitted with date and page on which it appeared. We will pay $1.00 for each RADIOTIC accepted and printed here. A few humorous lines from each correspondent should accompany each RADIOTIC. The most humorous ones will be printed. Address all RADIOTICS to

Editor RADIOTIC DEPARTMENT,
c/o Radio News.

HOORAY FOR SCIENCE

New type of the lowly washing utensil mentioned in the *Evansville*, Ind., *Press* of Aug. 13: "New Vacuum TUB amplifies current two million times." This is another case we put Mike of our Investigation Dept. on, and he says that it is a cross between a wash-tub and a vacuum tube. Look at Fig. 1.

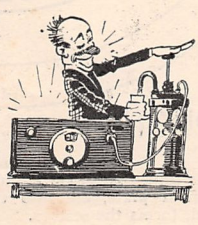
Contributed by
Paul Seiler

WHOOPS, DEARIE, WATCH THE MIKE!

Announcement in the *Pittsburgh Press* of Aug. 3, which tells the eager world of New Yorks' well known station "WEAF HOOP-UP 9 P. M. Max Jacobs and his Chamber Symphony orchestra." Evidently Mr. Jacobs' musicians are full of pep, vim and vigor, to be so listed.

Contributed by
Clarence Thompson

WAS THE SET OWNER ILLUMINATED TOO?



An illuminating advertisement from the *St. Louis Post-Dispatch* of Aug. 15: "L2M Ultradyne 'B' ILLUMINATOR for sale, complete, $100." We heard the expression many a time and oft that the "Tubes Won't Light," but now we have this wonderful gadget which lights up everything including the B part of the set.

Contributed by
E. G. LeMoine

A SECOND PIED PIPER OF HAMELIN

In the *Indianapolis Star* for Aug. 14 we have the following, in the programs of broadcasting for the day: "WQJ, Chicago, (447.5) 9 P. M. Radio RATISTS." Now are they using rats to develop radio? Sorta hard on the girls, don't you think? You know they just can't *stand* rats (aside—except in their hair, remember?)

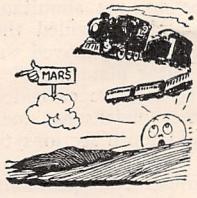
Contributed by
W. I. Mangus

TREAT HIM GENTLY, BROTHERS

Reminiscences of undergraduate days in the Sept., 1926 Radio News (Rasco advertisement): "INITIATED binding posts . . ." Do you more or less Solemnly swear to keep the secrets of the Royal Order of Uncommon Binding Posts? Yea, verily, Great Electron, I will. (Who's got a cigarette?)

Contributed by
H. Robert Potts

ANOTHER COLUMBUS OF SPACE



From the *Birmingham News* of Aug. 22 we have this transportation novelty: "Railway System to Install Radio. C. M. & St. Paul to Operate Lines Through Ether Wave Method." We were totally unaware that there is a special method of operating trains through the ether, but we know enough now to keep still when anything like this comes up for discussion.

Contributed by
Wood Rowe Purcell

WHERE DO THEY LIVE, ANYHOW?

In the *New York Daily News* of Aug. 6 we have the following fresh air note: ". . . tonight when the Wandering Minstrels and the Anglo-Persians TAKE THE AIR from this studio." None of the radio studios that we have been in ever had a great excess of fresh air floating around and we wonder why the minstrels should choose a place like that to get their air supply.

Contributed by
M. Yankofsky

AGAIN WE SAY, WHAT NEXT?

In an advertisement in the *Miami, Fla., Herald* of Aug. 2 there is this startling information: "Large stock of Parts and Accessories, including ARMATURE Transmitting Equipment . . ." Good bye to the motor truck, now that armatures are now being transmitted by radio. Ain't Science wonderful?

Contributed by
Henry B. Graves

PRETTY GOOD FOR A BEGINNER!

Announcement by the old reliable *New York Evening Post* on its moving day (Aug. 30): "Marconi TURNS TO RADIO! Senator Marconi has announced the perfection of a wireless loud speaker." Keep it up, Senator, and you may yet make a name for yourself in the radio art.

Contributed by
F. B. Thorne

First Prize

A COMPACT TRIPLE CONDENSER

By ROBERT N. AUBLE

A very compact, and if the workmanship is careful, a very efficient triple condenser may be constructed as shown in the accompanying sketches, and will be suitable for use in tuned-radio-frequency sets, in which tuning is accomplished by changing simultaneously capacities in three or more separate circuits.

A disc of thin copper, or other suitable conductor, is fastened with collodion to a four-inch dial. The shaft of the condenser is a ¼-inch brass bolt, which is threaded into a bushing in the panel. Rotating the dial will move the plate nearer or farther from the panel. Fixed to the panel, and insulated from the rotor plate by a thin sheet of mica, or other dielectric, is a similar disc of copper, which has been cut into three sectors, as shown. The rotor or dial plate constitutes the "grounded" section of the condenser, while the three sectors of the stator disc constitute the "live" plates, each being connected to its respective grid. Capacities are changed in the three circuits simultaneously and in equal amounts, provided the common rotor plate is uniformly moved toward or away from the stator plates.

The idea of this device may be extended to include more than three condensers, since it is necessary only to add more sections to the panel.

Obviously the dial must run perfectly true in order to maintain parallelism of the plates. If the three condensers are not perfectly matched, however, three small vernier condensers, constructed on the same plan as the large condenser, may be fastened on the inside of the panel. A flat-head screw, countersunk into the panel before the stator plates are put on, will make a satisfactory vernier. The shaft of the condenser should have a thread of fine pitch, in order that the rate of change of the capacities shall be small.

Prize Winners

First Prize $25

A Compact Triple Condenser

By ROBERT N. AUBLE
1121 Tecumseh St., Indianapolis, Ind.

Second Prize $15

A Multiple Phone Connector

By ALLISON H. JOHNSON
32 Rupert St., Amherst, N. S., Canada

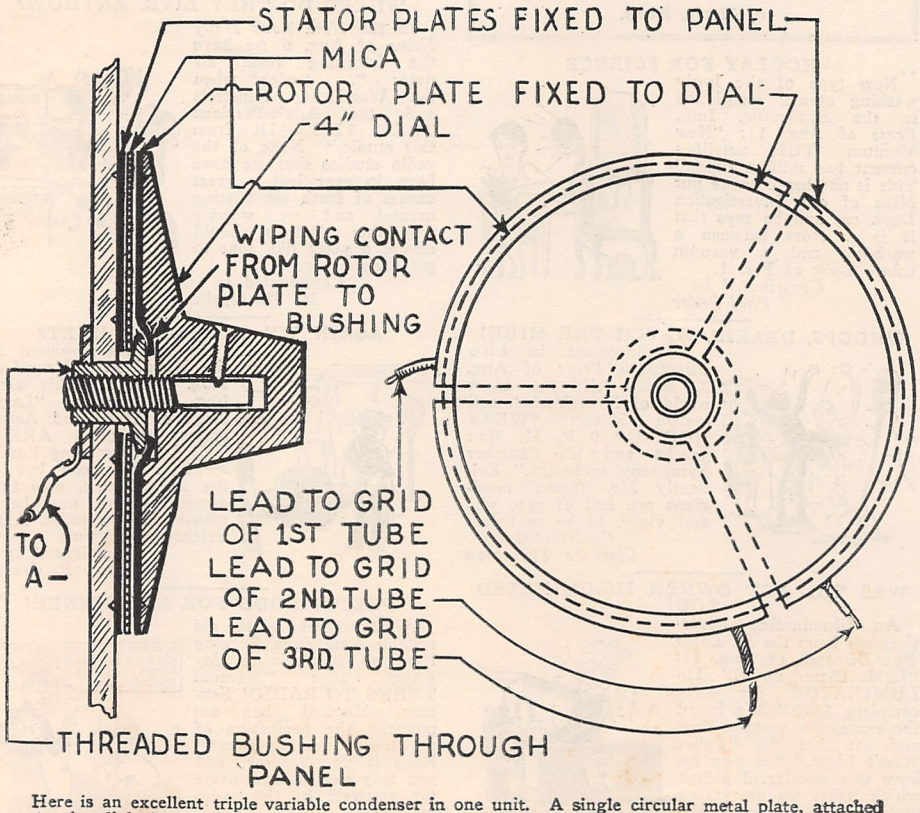
Third Prize $10

Flushing Device for Ground Connection

By C. A. OLDROYD
127 Abbey Road, Barrow-in-Furness, Lancashire, England

All published Wrinkles, not winning prizes, will be paid for at the rate of two dollars each.

The next list of prize winners will be published in the January issue.



Here is an excellent triple variable condenser in one unit. A single circular metal plate, attached to the dial, functions as all three rotors. A similar plate, cut into three sections and these fastened to the set panel, forms the stators.

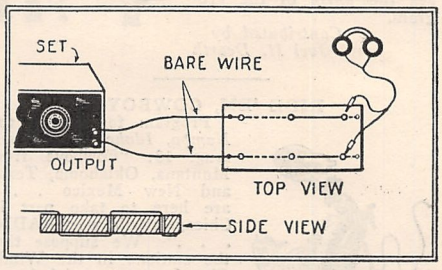
Second Prize

A MULTIPLE PHONE CONNECTOR

By ALLISON H. JOHNSON

It is quite often desirable to have some sort of an arrangement whereby a number of pairs of headphones can be easily and rapidly connected to the output of a radio receiver.

An inexpensive multiple phone connector for this purpose can be easily made from two pieces of bell wire and a block of hard wood measuring 2 x 1 x ¾ inches. The arrangement is clearly shown in the accompanying illustration: six holes, slightly larger in diameter than the phone tips, are drilled through the board, and the two pieces of bell wire, from which the insulation has been scraped, are laced through the series of holes. The ends of the two wires are fastened by small tacks, so that they cannot slip.



An exceedingly simple and efficient phone connector, made from a block of wood and two pieces of bare wire.

It is evident that, on inserting the phone tips in any two of the holes, they will make contact with the wires.

In this case three sets of headphones can be used, connected in parallel; but by making the board longer and drilling more holes for longer wires, any number of headphones can be accommodated.

Third Prize

FLUSHING DEVICE FOR GROUND CONNECTION

By C. A. OLDROYD

Fans usually devote a great deal of effort and time to the erection of a good antenna, but unfortunately they are inclined to forget that a good ground is quite as essential for good reception as a well-insulated antenna. The size of a suitable ground plate depends to some extent upon the soil in which it is buried; with very dry soil a larger plate should be used than in moist soil. A plate two feet square will generally be satisfactory. With a flushing device you can moisten the soil above and below the ground plate to saturation point and obtain hundred per cent efficiency.

Fig. 1 shows a section through the trench in which the plate has been buried. Above

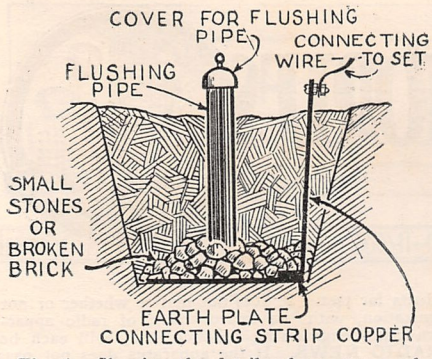


Fig. 1. Showing the details of a water-supply system for the ground connection. A set of pipes directs the water to all sections of the ground plate.

this small stones and broken bricks are placed for about four inches; on the stones rests the flushing pipe, which may have a diameter of from 1½ to 2 inches. The upper end of this pipe reaches well above the ground level; it is covered by a lid to prevent leaves, etc., falling into the pipe and clogging it.

Connection to the ground lead is made by a long copper strip or thick copper wire which has been riveted and soldered to the plate and projects about ten inches above the ground level.

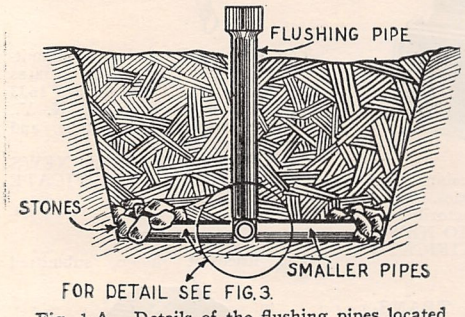


Fig. 1-A. Details of the flushing pipes located over the ground plate.

A MULTIPLE PIPE SYSTEM

A still more efficient solution is given in Fig. 2. Here four smaller pipes join the central flushing pipe and lead just over the edge of the earth plate; their ends are bridged over with stones or bricks to prevent the openings being clogged by settling soil.

The diameter of the main pipe may be about three inches; the smaller pipes need have a diameter of only about two inches. If a length of hose is used for this purpose, turning on the tap will fill the pipe in a few minutes.

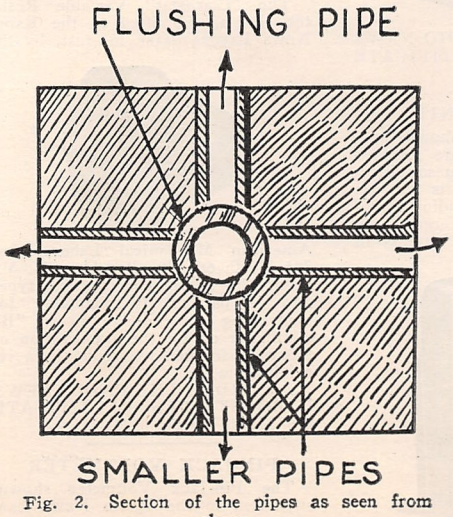


Fig. 2. Section of the pipes as seen from above.

Care must be taken to get a really sound joint between the upright main pipe and the four smaller ones. (See Fig. 3). The four smaller pipes are placed under the main pipe, so that their ends reach about half an inch beyond the inside edge of the vertical one. The first joint is made with clay, about two inches thick. Over the clay, concrete is poured to make a really sound joint. The concrete binds well with the pipe surfaces and the whole flushing pipe arrangement can be built above ground. When completed, and after the concrete has set, it is lowered into the trench dug for the earth plate.

In sandy soil, where this device is invaluable, the sand may tend to filter through the crevices between the stones, and clog the pipe mouth. If, however, a piece of

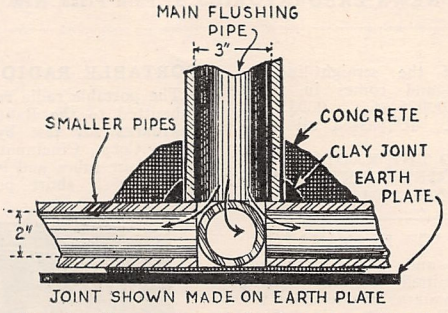
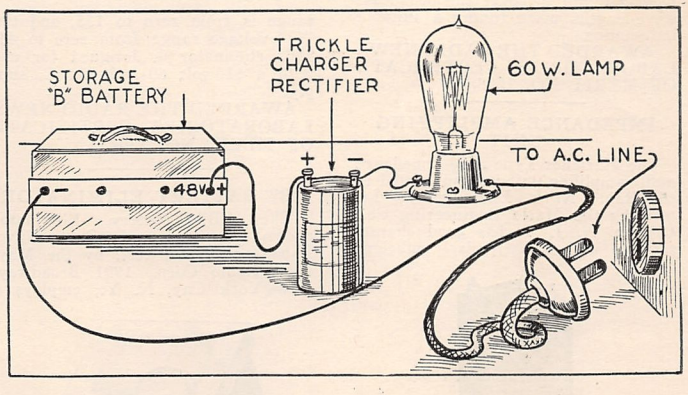


Fig. 3. Showing how the five pipes are joined to prevent leakage.

burlap is placed over the stones before the soil is filled in, the mouth of the pipe will be kept open.

A TRICK WITH A TRICKLE CHARGER

A trickle charger of the type using lead and tantalum in a solution of dilute sulphuric acid or aluminum and lead in a solution of borax or some similar salt, can be used to charge storage "B" batteries in the following manner. The rectifier jar is removed from its mounting and disconnected from its accompanying transformer. The polarity of the electrodes on the rectifier jar will be the same while charging "B" batteries as while charging the "A" battery. A lamp socket and a 60-watt lamp, plus a few feet of lamp cord with a standard plug attached, will complete the equipment.



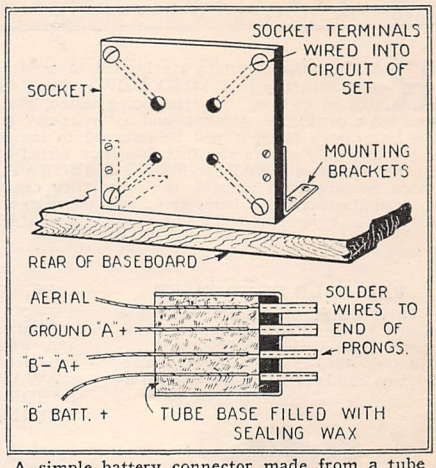
Showing how to use the tantalum-lead rectifier from a trickle charger for charging storage "B" batteries. A number of 48-volt units can be charged at one time by connecting them in parallel.

One side of the lamp socket is connected to the negative electrode of the rectifier, the positive electrode is connected to the positive 48-volt side of a "B" battery block. The negative "B" battery line and the line from the side of the lamp socket opposite to the side already tapped are then connected to the 110-volt A.C. line as shown. When the lamp is inserted in its socket the "B" battery goes on charge. When the "B" battery is charged the rectifier jar may be returned to its regular position, where it will function as usual.

Contributed by J. P. Kennedy.

A PLUG-IN AERIAL AND BATTERY CONNECTOR

A very practical method of connecting battery wires to a radio set can be followed easily by any one, with very little expense and labor. It can be adapted to the needs of any particular set, by slight variation of the scheme. With this system of connection, when it is desired to move the table



A simple battery connector made from a tube base and a UX tube socket.

on which the set is placed, for sweeping the floor or other reasons, all that is necessary is to pull out the plug, and the table is free to be moved anywhere.

The parts needed are as follows: one UX type socket, a discarded UX tube to fit same, the flexible lamp cord or battery cable for connection from the set to the batteries.

As the writer's set was built with the "B" battery inside the cabinet, only four leads were needed, viz: aerial, ground, "A" minus and "A" plus. After describing this method of installation, other applications of the plan will be given.

Mount the socket in a vertical position at the rear, and in the center of the baseboard, with the top of the socket facing towards the back of the cabinet. This can be done by using small brackets made of stiff brass; their exact shape will depend upon the type of socket used, and will present no problem to the average builder. When firmly fastened in place, the socket is wired into the circuit, using one terminal for the antenna connection, the opposite terminal for ground, and the remaining two for "A+" and "A—", respectively. In case the circuit calls for a grounded "A" battery, the proper terminal can be grounded at the socket by using a strip of sheet copper connected across the ground and desired "A" battery terminal of the socket. This completes the work on the set itself.

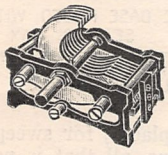
Break all glass out of the tube to be used as a plug, and clean out cement and all interior of base, leaving only a shell with the four prongs intact. To each prong, on in-

(*Continued on page* 522)

RADIO manufacturers are invited to send to RADIO NEWS LABORATORIES, samples of their products for test. It does not matter whether or not they advertise in RADIO NEWS, the RADIO NEWS LABORATORIES being an independent organization, with the improvement of radio apparatus as its aim. If, after being tested, the instruments submitted prove to be built according to modern radio engineering practice, they will each be awarded a certificate of merit, and a "write-up" such as those given below will appear in this department of RADIO NEWS. If the apparatus does not pass the Laboratory tests, it will be returned to the manufacturer with suggestions for improvements. No "write-ups" sent by manufacturers are published on these pages, and only apparatus which has been tested by the Laboratories and found to be of good mechanical and electrical construction is described. Inasmuch as the service of the RADIO NEWS LABORATORIES is free to all manufacturers whether they are advertisers or not, it is necessary that all goods to be tested be forwarded prepaid, otherwise they cannot be accepted by the Laboratories. Apparatus ready for the market or already on the market will be tested for manufacturers, as heretofore, free of charge. Apparatus in process of development will be tested at a charge of $2.00 per hour required to do the work. Address all communications and all parcels to RADIO NEWS LABORATORIES, 53 Park Place, New York City.

VARIABLE CONDENSER

This S.L.F. condenser was submitted to the RADIO NEWS LABORATORIES for test, by the Chelten Electric Co., 4863 Stenton Ave., Philadelphia, Pa. It is a well-designed con-

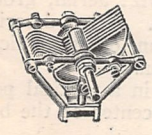


denser which covers the entire broadcast wave-length range.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1278.

VARIABLE CONDENSER

This condenser was submitted to the RADIO NEWS LABORATORIES for test, by the Walnart Electric Mfg. Co., 308 S. Green St., Chicago, Ill.



It was found to cover the broadcast wave-lengths when tuning a suitable inductance.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1298.

IMPEDANCE AMPLIFYING UNIT

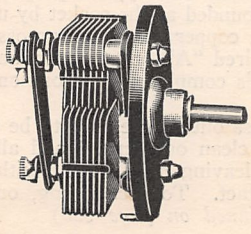
The Marlefier Type A-23 impedance audio-amplifier unit was submitted to the RADIO NEWS LABORATORIES for test, by the Marle Engineering Co., Orange, N. J. It has good characteristics and is particularly efficient

in the amplification of the low frequencies.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT No. 1412.

VARIABLE CONDENSER

The variable condenser shown, submitted to the RADIO NEWS LABORATORIES for test, by the Lee Electric and Manufacturing Company, 220 Eighth St., San Francisco,

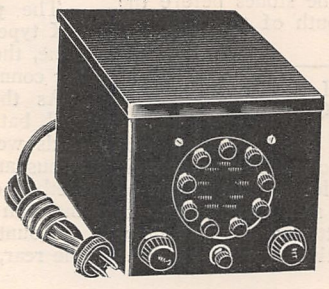


Calif., is of the straight-line-frequency type and comes in three capacities .00025-μf., .00035-μf., and .0005-μf. It passed all tests satisfactorily.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1504.

"B" AND "C" ELIMINATOR

The "B" and "C" Eliminator shown, submitted to the RADIO NEWS LABORATORIES for test, by the De-Witt La France Co., Cambridge, Mass., employs an electrolytic rectifier instead of a tube, and is noiseless in operation. The "B" voltage

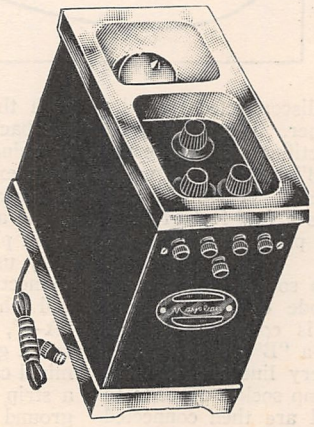


range is from zero to 135, and the "C" voltage range from zero to 45. This eliminator is designed for use with a 110-volt 60-cycle A. C. supply.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1507.

"B" BATTERY ELIMINATOR

The "B" battery Eliminator shown, submitted to the RADIO NEWS LABORATORIES for test, by the Mayolian Radio Corp., 1991 Broadway, New York City, N. Y., employs a

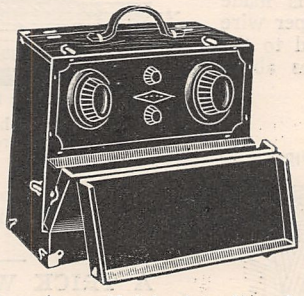


Raytheon rectifier tube and has a voltage range from zero to 180. There are three variable voltage taps. It gave excellent results on test.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1453.

PORTABLE RADIO RECEIVER

The portable radio receiver shown, submitted to the RADIO NEWS LABORATORIES for test by the Crosley Radio Corp., Cincinnati, Ohio., employs four tubes and is designed for use with a short portable aerial.

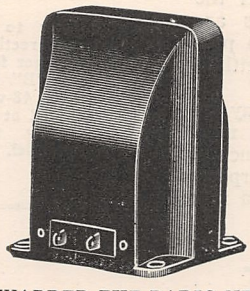


Space is provided in the cabinet for the "A" and "B" batteries. The set passed all tests satisfactorily.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1509.

AUDIO-FREQUENCY TRANSFORMER

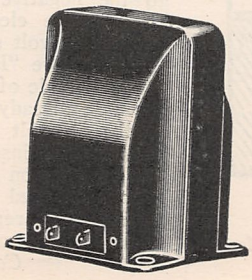
The Audio-Frequency Transformer shown, submitted to the RADIO NEWS LABORATORIES for test, by the Samson Electric Co., Canton, Mass., employs a new type of coupling system, and gave excellent results on test.



AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1510.

IMPEDANCE UNIT

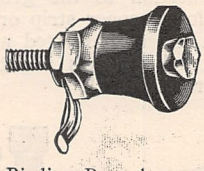
The Impedance Unit shown, submitted to the RADIO NEWS LABORATORIES for test, by the Samson Electric Co., Canton, Mass., is for use in impedance-coupled audio amplifiers. There are four different types for coupling the various circuits in



the audio-frequency amplifiers, all of which proved satisfactory on test.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1511.

BINDING POST

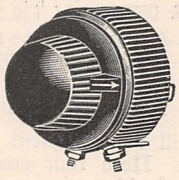


The Binding Post shown, submitted to the RADIO NEWS LABORATORIES for test, by D. T. Mitchell, 1633 Brooklyn Avenue, Brooklyn, N. Y., is of the spring-pressure type, and of very good construction.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1514.

RHEOSTAT

The Rheostat shown, submitted

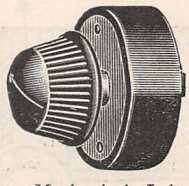


to the RADIO NEWS LABORATORIES for test, by the Chicago Telephone Co., Elkhart, Ind., has a resistance value of 6 ohms and is designed for heavy-duty work; it can be used for controlling a number of tubes or a single power-amplifier tube. It was found to be of excellent construction.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1516.

VARIABLE RESISTOR

The "Clarostat" Variable Resistor shown, submitted to the RADIO NEWS LABORATORIES for test, by the

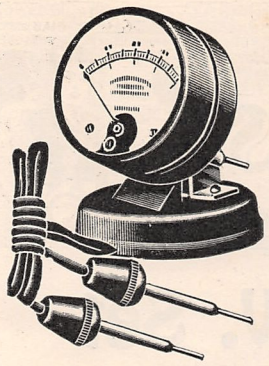


American Mechanical Laboratories, 285 North 6th St., Brooklyn, N. Y., is of the carbon-construction type; and is particularly adaptable for controlling the voltage in a "B" eliminator or for the stabilization of the radio-frequency circuits in a receiving set.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1526.

PIN-JACK VOLTMETER

The Pin-Jack Voltmeter shown, submitted to the RADIO NEWS LABORATORIES for test, by the Weston

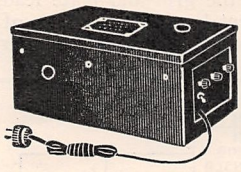


Electrical Instrument Corp., Newark, N. J., can be plugged into the panel of the receiving set or used in connection with the mounting base shown. It has two scale ranges; namely, zero to four volts, and zero to 160 volts when used with the base. This meter was found to be of excellent construction.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1527.

"B" ELIMINATOR

The "B" Eliminator shown, submitted to the RADIO NEWS LABORATORIES for test, by the Precision Electric Mfg. Co., 717 E. 9th St.,

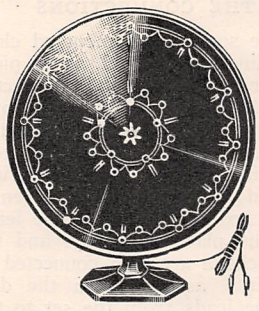


Los Angeles, Calif., employs a very convenient form of rectifier. The voltage range of the "Model L" unit is from zero to 90; that of the "Model M" unit from zero to 135. They are designed for use on 110-volt, 50- or 60-cycle A.C. supply, and gave excellent results on test.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1531.

LOUD SPEAKER

The "Musicone" Loud Speaker shown, submitted to the RADIO NEWS



LABORATORIES for test, by the Crosley Radio Corp., Cincinnati, Ohio, is of the free-edge type. It was found to give excellent reproduction throughout the whole speech-frequency scale. The mechanical construction is excellent.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1533.

HEAD PHONES

The Head Phones shown, submitted to the RADIO NEWS LABORA-

TORIES for test, by Von Mihaly, Berlin, Germany, are of unique construction and particularly desirable because of their light weight. They have a resistance value of 2,000 ohms, and gave excellent results on test.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1534.

HEAD-PHONES

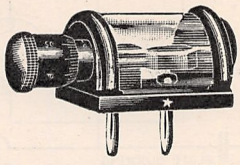
The "Blue-Spot" head-phones shown, submitted to the RADIO NEWS LABORATORIES for test, by the Ideal Radiotelefon & Apparatefabrik, Copenicker Str.—10a, Berlin, S. O. 33, Germany, have a resistance of 4,000 ohms and were found to be very sensitive. They are of the usual head-phone construction, but

relatively light in weight. They passed all tests satisfactorily.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1535.

PRECISION DETECTOR

The "Red-Star" Precision Detector shown, submitted to the RADIO NEWS LABORATORIES for test, by the Ideal Radiotelefon & Apparatefabrik, Copenicker Str.—10a, Berlin, S. O. 33, Germany, has a micrometer adjusting knob and movable catwhisker, so that contact can be made with any portion of the crystal. The whole unit is mounted inside of a glass case, thus making it dust-proof. It is of excellent material.



AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1536.

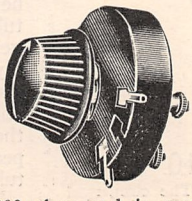
CRYSTAL DETECTOR

The "Blue-Spot"' Crystal Detector shown, submitted to the RADIO NEWS LABORATORIES for test, by the Ideal Radiotelefon & Apparatefabrik, Copenicker Str.—10a, Berlin, S. O. 33, Germany, is dust-proof and has two adjustments; one for the crystal and the other for the contact point. It was found to be of excellent construction.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1538.

VARIABLE RESISTOR

The Variable Resistor shown, submitted to the RADIO NEWS LABORATORIES for test, by the Central Radio Laboratories, 16 Keefe Ave., Milwaukee, Wis., has a maximum value

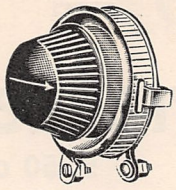


of 50,000 ohms and is particularly valuable when employed across the secondary winding of an audio-frequency transformer as a means for eliminating distortion and excessive noisiness. It is of excellent construction.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1539.

RHEOSTAT

The Rheostat shown, submitted to

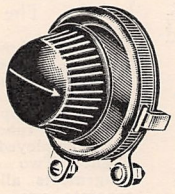


the RADIO NEWS LABORATORIES for test, by the Central Radio Laboratories, 16 Keefe Ave., Milwaukee, Wis., is of the heavy duty type and employs a ribbon resistance instead of the usual wire resistance. It has a value of 3 ohms and can be employed for controlling a series of tubes or a single power amplifier.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1540.

RHEOSTAT

The Rheostat shown, submitted to the RADIO NEWS LABORATORIES for test, by the Central Radio Labora-

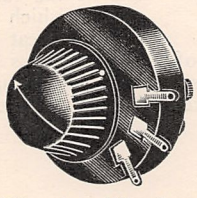


tories, 16 Keefe Ave., Milwaukee, Wis., is supplied in a number of resistance values to conform to the various types of tubes now on the market. It was found to be of excellent mechanical and electrical construction.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1540.

MODULATOR POTENTIOMETER

The Modulator Potentiometer shown, submitted to the RADIO NEWS LABORATORIES for test, by the Central Radio Laboratories, 16 Keefe

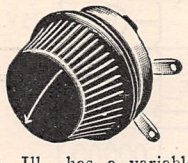


Ave., Milwaukee, Wis., has a maximum resistance of 2,000 ohms and is designed particularly for use as a volume control or oscillation control. It is of excellent construction.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1541.

VOLUME CONTROL

The "Hi-Ohm" Volume Control shown, submitted to the RADIO NEWS LABORATORIES for test, by the Carter Radio Co., 300 S. Racine Ave.,

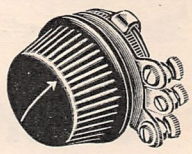


Chicago, Ill., has a variable resistance of high ohmage and is particularly adaptable for use in connection with radio- or audio-frequency amplifiers, for the purpose either of stabilizing or controlling volume. It is of excellent mechanical construction.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1542.

POTENTIOMETER

The "Hi-Pot" Potentiometer shown, submitted to the RADIO NEWS LABORATORIES for test, by the Carter Radio Co., 300 S. Racine Ave., Chicago, Ill., has a maximum resistance of 500,000 ohms and is very effec-

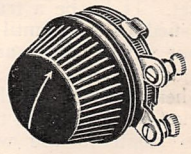


tive for use as a volume control or a stabilization control, in connection with radio- or audio-frequency amplifiers.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1544.

MIDGET RHEOSTAT

The Midget Rheostat shown, submitted to the RADIO NEWS LABORATORIES for test, by the Carter Radio

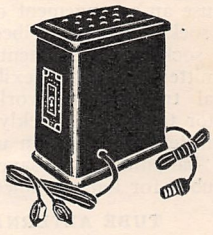


Co., 300 S. Racine Avenue, Chicago, Ill., is of excellent electrical and mechanical construction and is supplied in various resistance values. Test has proved it to be very satisfactory.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1546.

"A" BATTERY CHARGER

The "A" Battery Charger shown, submitted to the RADIO NEWS LABORATORIES for test, by the France Mfg. Co., 10321-35 Berea Road,

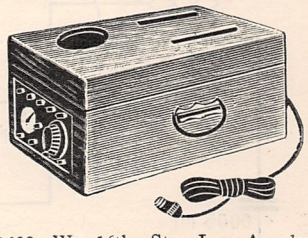


Cleveland, Ohio, is for use on a 110-volt, 60-cycle light line. It will charge a four- or a six-volt storage battery at a 2-ampere rate. It passed all tests satisfactorily.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1550.

POWER UNIT

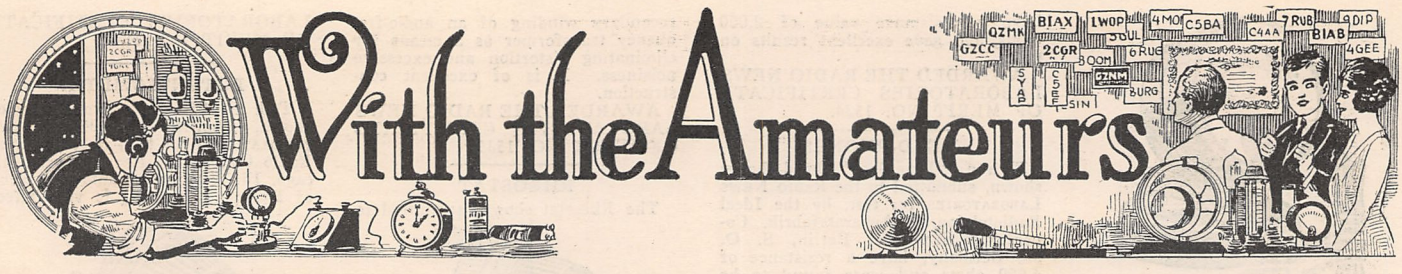
The Power Unit shown, submitted to the RADIO NEWS LABORATORIES for test, by the Brant Battery Co.,



1622 W. 16th St., Los Angeles, Calif., comprises storage "A," "B" and "C" batteries together with a charger. The "B" battery range is from zero to 135 volts. The storage "A" battery is of the 6-volt type. The large switch on the front panel controls the charger. This unit gave excellent results on test.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1553.

(*Continued on page* 576)



Socket Arrangement for a C.W. Set

5, 50 or 100 Watts at Will

By CHARLES F. FELSTEAD, 6CU.

WHEN about to build a C.W. transmitter, the amateur is always faced by the problem of whether to begin by building a small transmitter, or to wait until he has enough money to construct a larger and more powerful set. If he be a true ham he will not be satisfied to wait until he can buy a big tube, but will hook up any tube he can get his hands on, and *make* it work. As a result, when he does purchase a larger tube, the sockets and most of the parts of the set are too small to use with the new tube, which draws a greater current than the old one.

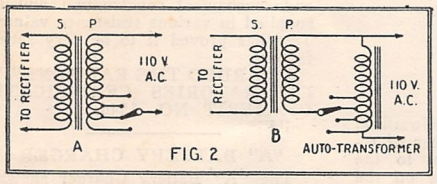


FIG. 2

A more logical way to build a transmitter, and the way the writer built his first set, is to use an arrangement of large and small tube sockets, as described in this article. This socket arrangement makes a C.W. transmitter far more flexible and useful for general transmitting work. It allows the operator to change quickly the power of his transmitter; thus he can use low power for local "hamming" and save the more expensive tubes for long-distance work at night.

TUBE ALTERNATIVES

The general idea of this arrangement of sockets is shown in Fig. 1. In this case, two 50-watt tube sockets and a 5-watt socket are wired together. Only a part of the circuit is shown, so that the reader may see more clearly how the connections are made to the sockets. The 5-watt socket is in the middle, and the 50-watt sockets on each side of it, as will be seen. This allows the operator to use a 5-watt tube alone; a 50-watt tube; or two 50-watt tubes in parallel.

The two sockets that are alike must be placed on the outside, and the odd socket in the middle; so that the grid leads to the two similar tube sockets will be of equal length. The plate leads must also be of equal length, if the two tubes are to work together at greatest efficiency. If the set is so wired that the grid, or plate, leads to the two tubes which are used together are of unequal length (as in Fig. 1A) the circuits will be tuned to different frequencies; and one of the tubes, the one connected to the circuit which is out of resonance, will be likely to heat badly. A tube that is heating is just a loss in the circuit, for most of its energy is being wasted in heating the plate, instead of being radiated; and the tube which is oscillating, is doing practically all of the work.

It is not necessary that the grid and plate leads to the center socket be of the same length as those to the two outside sockets; because the tube in the center socket will not be operated together with the tubes in the outer sockets, which are of a different power. So, since the center tube cannot be used with the other tubes, it will not make any difference if the grid and plate leads to it are of a different length from those of the other tubes—outside of making necessary a slight readjustment of the tuning condenser when the tubes are changed.

Left: Showing two methods whereby the plate voltage supplied by a transformer can be reduced for application to a smaller tube than usually employed. Right: Two circuit arrangements allowing the separate use of low or high-power tubes. Two 50-watt tubes can be used at the same time in the circuit of Fig. 1, but only one 50-watt tube at a time can be used in the circuit of Fig. 1-A, as the leads are not of equal length.

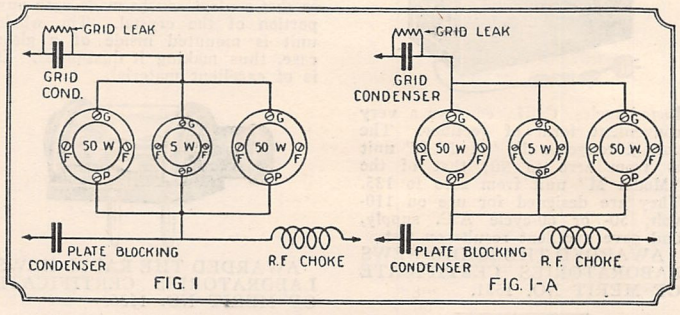


FIG. 1 FIG. 1-A

MAKING THE CONNECTIONS

The three tube sockets are mounted close together and in line, as in Fig. 1, and a piece of heavy wire or copper tubing is connected between the grid terminals on the two outside sockets, the plate terminals being similarly connected. The exact centers of these two pieces of wire are found by measuring, and the grid and plate wires of the center socket connected to these points. The leads from the grid and plate condensers and the radio-frequency choke are also connected to these center points, as shown in the diagrams. Thus the leads from the set to the grids of the two outside tubes are exactly equal in length, and the two tubes will oscillate at the same frequency.

It will be necessary, with this socket arrangement, to have the filament and plate power sources variable, so that the voltages can be cut down when the smaller tube is used. If the filament is heated from the A.C. lines through a transformer, as usual, a large rheostat or a heavy wire resistance, such as the heating element from an electric iron, can be used in the primary circuit. This will allow a voltage variation great enough so that the same transformer may be used with either the 5-watt or the 50-watt tubes without having to tap it. If a motor generator is used for the high voltage supply, its voltage can be reduced by increasing the field resistance. If the plate voltage is obtained from a high-voltage transformer, the primary of the transformer can be tapped to cut down the voltage for the small tube (as shown in Fig. 2A) or a special, tap-

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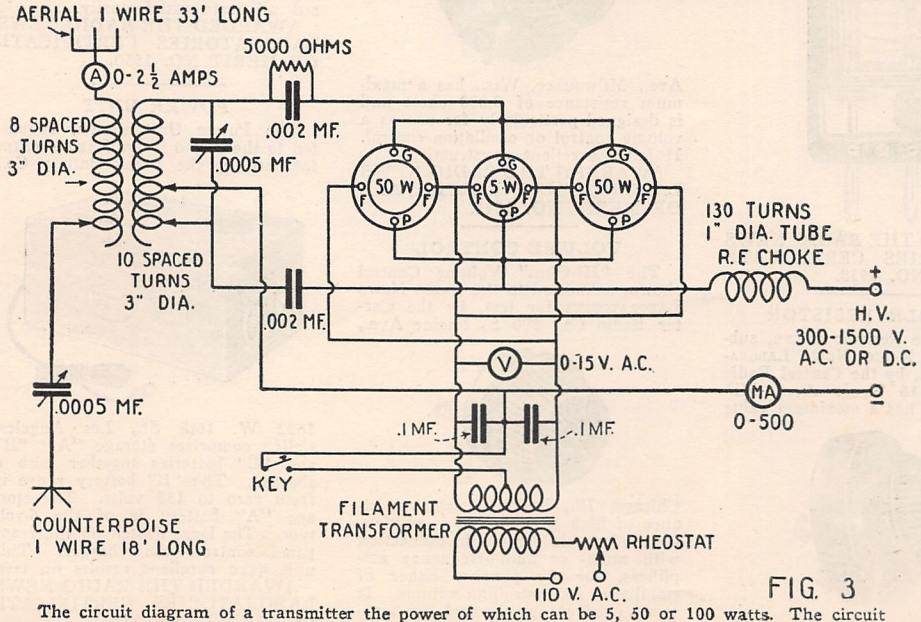
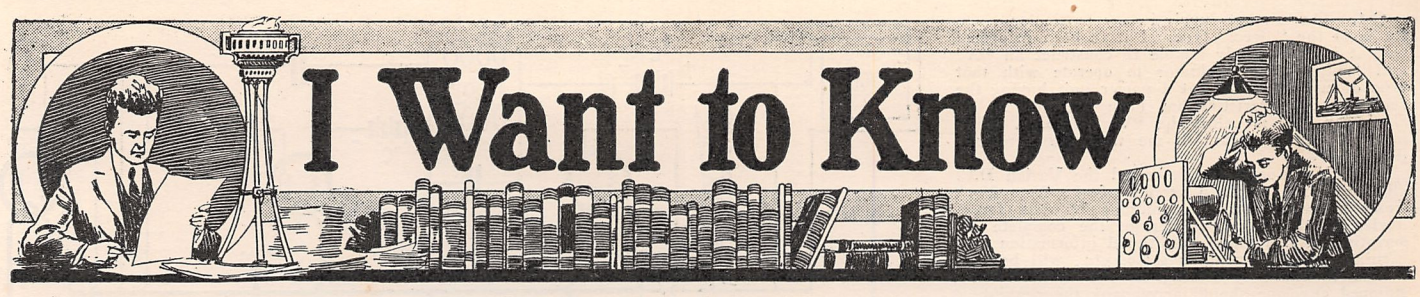


FIG. 3

The circuit diagram of a transmitter the power of which can be 5, 50 or 100 watts. The circuit values given are for 40 meters.



Conducted by Joseph Bernsley

THIS Department is conducted for the benefit of our Radio Experimenters. We shall be glad to answer here questions for the benefit of all, but we can publish only such matter as is of sufficient interest to all.

1. This Department cannot answer more than three questions for each correspondent. Please make these questions brief.
2. Only one side of the sheet should be written upon; all matter should be typewritten or else written in ink. No attention paid to penciled matter.
3. Sketches, diagrams, etc., must be on separate sheets. This Department does not answer questions by mail free of charge.
4. Our Editors will be glad to answer any letter, at the rate of 25c. for each question. If, however, questions entail considerable research work, intricate calculations, patent research, etc., a special charge will be made. Before we answer such questions, correspondents will be informed as to the price charge.

Mr. Bernsley answers radio questions from WRNY every Thursday at 8:15 P. M.

BROADCAST STATION

(Q. 2191) Mr. M. Halpern, Brooklyn, New York, asks as follows:

Q. 1. I would like complete constructional details, including the wiring diagram, of a broadcast station which I contemplate constructing. I am desirous of employing the 50-watt tubes, two as oscillators, and two as modulators, using the Heising system of modulation. Also a speech-amplifier system of some sort incorporated. A complete list of parts that would be necessary, and any pointers that you could give me concerning the adjustment of the transmitter, etc., would be of extreme help to me.

A. 1. It is an exceedingly difficult proposition to construct an efficient broadcast station. Nevertheless, as we have received numerous calls for similar information, we here describe a complete transmitter incorporating a speech-amplifier system, which may be used for broadcasting purposes. The circuit diagram is shown in Fig. Q. 2191; the Heising system of modulation is employed. Either 5- or 50-watt tubes may be employed, the plate voltage being the only variable feature, should it be desirous to switch from one to the other. The transmitter, of course, must be ruggedly constructed and well insulated to withstand high voltages.

The following are the items necessary for the construction of this transmitter:

1 R.F. Choke Coil, consisting of 300 turns of No. 28 D.S.C. wire, wound on 1½-inch bakelite or rubber tube, approximately 9 inches in length;
1 Oscillation Transformer, consisting of primary and secondary inductances employing flat copper ribbon, helically wound;
1 Transmitting-Type Variable Condenser, .0005-μf. double-spaced;
1 Transmitting-Type Variable Condenser, .00035-μf. double-spaced;
1 Thermo-ammeter, 0 to 5 scale, employed for indicating the antenna current which is being radiated;
4 50-watt type sockets (assuming that 50-watt tubes are to be employed);
2 Modulation Transformers;
1 Non-inductive Resistance, 5,000-ohm;
2 Fixed Condensers, transmitting type, .002-μf.;
1 Milliammeter, 0 to 500 scale;
1 Voltmeter, 0 to 1,500 volts (an external resistance is necessary with this voltmeter due to the high voltage which it must indicate. The two are sometimes purchased in separate form, although each must be designed for the other);
1 Voltmeter, 0 to 15 scale;
1 Choke Coil (transmitting type), 30-henry;
2 Fixed by-pass condensers, 4.0-μf., breakdown voltage 1,500 volts;
1 Fixed by-pass Condenser, 4.0-μf., breakdown voltage 2,000 volts;
1 Plate Reactor (RCA-UP 415);
2 Rheostats, heavy-current type designed for 50-watt tubes;
1 Sensitive Microphone;
1 Motor Generator (generator's output variable, maximum voltage 1,500 volts with a load. Also it should be rated at least 300 watts output);
1 Western Electric 7-A Amplifier;
3 216A Tubes for the above-mentioned Amplifier;
1 Milliammeter, 0 to 100 scale;
1 Potentiometer, 200-ohm;
2 Double-Pole Single-Throw Switches;
1 Lighting Switch;
1 Variable Resistance, 0-25,000-ohm;
1 Double-Pole Double-Throw Switch.

Miscellaneous, such as screws, bolts, angle iron for constructing framework for the transmitter, No. 12 rubber covered wire for wiring the transmitter, etc.

The transmitter as illustrated, is inductively coupled, and must be so to comply with the government requirements, as well as to emit a wave with a "sharp" characteristic. Ten volts is normally required for lighting the filaments of the 50-watt tubes. It would be best to employ storage batteries or a separate generator for this purpose. The use of A.C. for radiophone purposes is impractical unless the financial resources of the constructor are considerable.

Adjustment of the Transmitter

Condenser C1 is the fundamental condenser for adjusting the wavelength of the transmitter. C2 is known as an antenna series condenser, and is usually employed in cases where the antenna is too long, and the fundamental wave too high. C2 is rotated until maximum radiation current is obtained, which is indicated by the Thermoammeter, otherwise known as the radiation ammeter. If the plates of the oscillator tube become incandescent, or near a "white heat," then either too high a plate voltage is being forced upon the tube, or the energy supplied to the tube is dissipated in the form of heat, instead of being supplied to the antenna. Varying the clips, on the primary inductance of the oscillation transformer, will vary the wavelength of the transmitter. The center clip, or "A—" usually has considerable to do with whether the tubes are oscillating properly and supplying the proper antenna currents, or whether dissipation of the energy takes place. In other words, if the plates of the oscillator tube heat up too much then it can be assumed that the center tap is in an incorrect position, and should be varied.

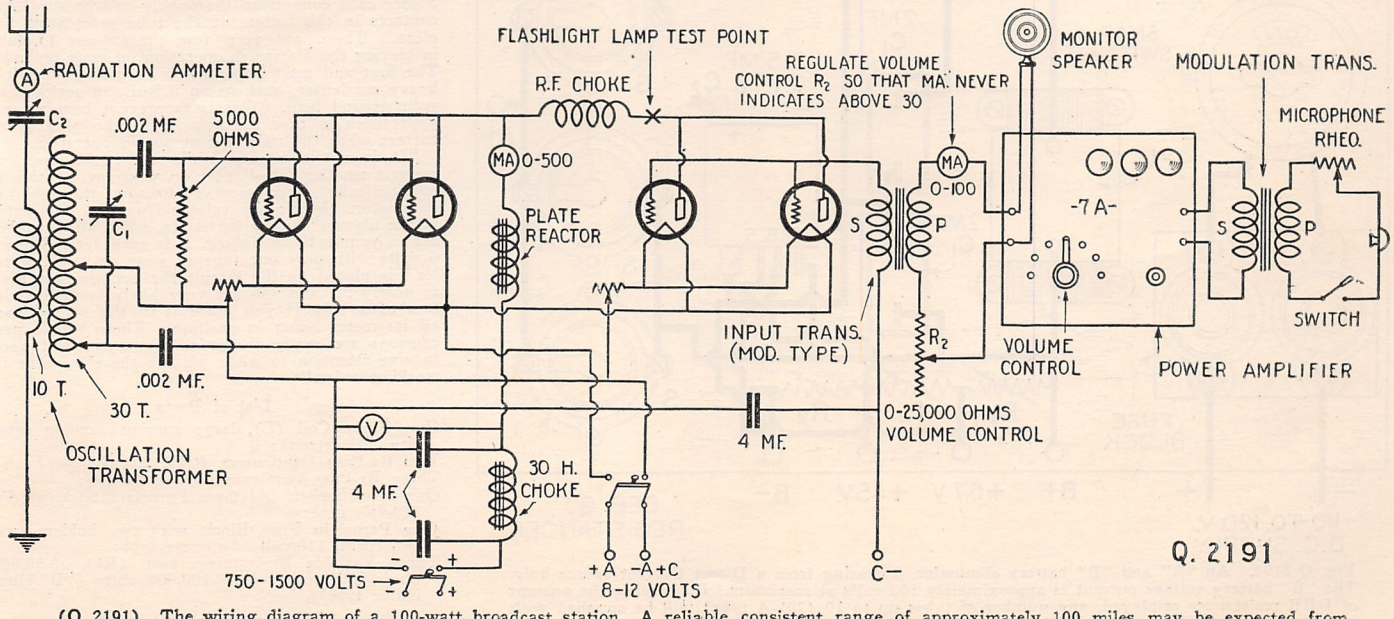
The speech amplifier is employed for intensifying the speech or music before it is fed to the modulator tubes. The volume control and variable resistance should be under the control of the operator at all times during the period of transmission. Should the speakers or singers increase the volume of their voices the operator must simultaneously increase the value of the resistance employed for this purpose, to keep the sound at an even intensity.

When testing for radiation it will be noted that while the plates of the oscillator tubes are glowing red, the modulator tubes seem to be comparatively cool. This is as it should be, as the modulator tubes do not function until the microphone and speech amplifier are connected up to the "input" terminals. A test for whether they are functioning correctly or not, may be made in the following manner.

Insert an ordinary flashlight lamp (6- or 12-volt type) in series with the plate circuit of the modulator tubes and the R.F. choke. If this tube glows brightly or blows out when the microphone is spoken into, then we can assume that the tubes employed for modulation purposes are functioning correctly. The circuit should be jumped immediately after the modulation test is made; in other words, do not leave the flashlight lamp in the plate circuit as it will only serve to absorb energy from the modulator tubes.

"A" AND "B" ELIMINATOR FOR D.C.

(Q. 2192) Mr. Robert Schwartz, Boston, Mass., asks:



(Q. 2191) The wiring diagram of a 100-watt broadcast station. A reliable consistent range of approximately 100 miles may be expected from this type of transmitter.

Q.1. The current supply in my particular vicinity is of the "direct" type. I have been informed that it is exceedingly simple to construct an "A" and "B" battery eliminator to operate with that type of current; and that a power unit having the requisite characteristics has been designed by F. G. Logan and is called the "Varion" D.C. Eliminator. Can you furnish me with the necessary details?

A.1. Mr. Logan has described the Varion D.C. eliminator in the radio section of the *New York Telegram*. Because of numerous requests for a device of this type, we reprint the complete description of this unit. Additional information concerning parts, source for same, etc., will be furnished to those requesting it. A self-addressed stamped envelope should accompany the request.

"Until recently little attention has been given to the requirements of the radio owner with direct current in his home. Many a man has walked hopefully from one radio store to another in search of data on the construction of a good "A" and "B" eliminator for direct current. But he has met with disappointment on every hand. 'We don't know of any such thing,' was the unsatisfactory answer he received in every store.

"True, direct-current eliminators have been put on the market, but we have seen none which supplies both "A" and "B" current and which has voltage variation over the wide range necessary to take care satisfactorily of detector, radio-frequency and oscillator tubes, many of which operate at their best only if just the right voltage for the particular tube is applied.

"Why there has been a lack of attention to the design of an all-around, efficient eliminator for direct current is hard to understand. Certainly not because of lack of demand, for in Manhattan and Brooklyn alone there must be several hundred thousand installations with direct current. As far as the difficulties in design and building go, there is, of course, much less trouble and expense involved in the construction of a good eliminator for direct current than in one for alternating current. The necessity of rectifying is done away with, and with it the use of a number of expensive chokes and condensers to smooth out the rectified (and often very interrupted) direct current. The cost of a D.C. eliminator is naturally much lower, since less apparatus is required. So, if you are one of those fortunate individuals with direct current in your home, prepare to eliminate "A" and "B" batteries at small cost and without sacrifice in operating efficiency.

"The D.C. eliminator described in this article replaces both "A" and "B" batteries at a cost of approximately $33.00 for the complete equipment required, a little less than the investment necessary to purchase a good 100-ampere-hour storage battery and a charger. The expense of a set of "B" batteries would bring the cost considerably higher. With this cost in mind it can be seen that building for oneself a D.C. eliminator is decidedly an economy.

Simplicity of the Varion

"In designing the Varion every effort was made to keep assembly and construction as simple and safe as possible. That this effort succeeded quite well is attested by the fact that the eliminator has been constructed and placed in successful operation on a receiver by a non-technical builder in an hour and three-quarters time. There is really nothing difficult or complicated about it, as there are only fourteen soldered connections and there are no special coils or chokes to wind. All the parts required can be purchased at any well-stocked radio store.

"The second, and probably the more important, point is that there is nothing to deteriorate or wear out in this particular eliminator. The resistances, of course, are good for a lifetime; and as they practically constitute the eliminator one is fixed for many years when he builds this unit.

"If the eliminator is constructed with the apparatus, and following the layout shown here, no difficulty will be had in conforming to all the specifications of the Underwriters' Laboratory. Both legs of the incoming D.C. line are equipped with fuses, and in case of an overload, even a very slight one, they will blow and protect your equipment and accessories.

Details of the Varion

"The Varion does away with both "A" and "B" batteries in the following manner: The direct-current line is shunted by a current-carrying resistance or resistances, as shown in the wiring diagram. The filament supply is taken off from the negative side of the line at a point between resistances AR-1 and AR-2. By variations of the resistances AR-1 and AR-2 the unit will accommodate any filament-current drain from ¾ ampere to 2½ amperes. This takes in sets ranging from 3 to 10 tubes. If a heavier current drain is imposed upon the unit it is possible to obtain extra current by means of suitable resistances. To figure the correct resistances to use, let us assume you have a 5-tube Neutrodyne set, with one power tube in the last stage. Four 201-A tubes draw ¼ ampere each at 5 volts, or a total of 1 ampere; the power tube will draw ½ ampere at 5 volts. This gives us a total of 1½ amperes for the filament consumption.

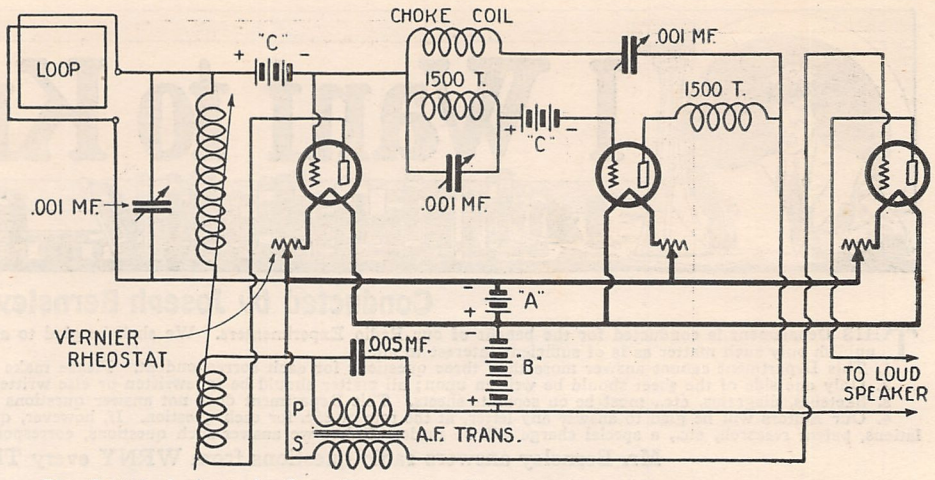


Fig. Q 2193. A three-tube Super-Regenerative Circuit which the average constructor can build with the assurance that the troublesome defects, usually encountered in this type of circuit, are eliminated or minimized to a great extent. Very satisfactory loop reception may be expected, if this circuit is constructed properly.

Figuring the Resistances

Filament Consumption Amperes	Resistance	Resistance
.75	1 DEB 90	1 EB 12.5
1.	2 DEB 90	1 EB 5
1.25	2 DEB 90	1 EB 6
1.5	2 DEB 90	1 EB 7
1.75	2 DEB 90	1 EB 10
2.	3 DEB 90	1 EB 3.5
2.25	3 DEB 90	1 EB 4.25
2.5	3 DEB 90	1 EB 5

"Looking at the table above, it will be seen that resistance "DEB" should consist of two Vitrohm units (DEB 90) and "EB", of one Vitrohm resistance (EB-7.) This is simple and should offer no difficulties to any one utilizing this current supply for any type of set. Almost any combination of voltages up to 110 can be obtained without difficulty. If necessary you may have three different voltages for your receiver. This feature makes the eliminator particularly desirable for use with the superheterodyne and some types of tuned-radio-frequency sets where a number of different "B" battery voltages are desired.

Determining "B" Battery Voltages

"A total of 200,000 ohms is placed across the 115-volt D.C. line, as shown in the wiring diagram. There are three units used and two possible voltage variations. The "B" voltage outputs shown in the diagrams are those commonly used; but the experimenter may vary the resistances to produce almost any voltage value from 10 to 110 volts. If more than three "B" taps are brought out from the resistance line, however, be sure that an 0.5-μf. tap condenser is shunted from the extra tap to the negative "B" battery line. This precaution is taken to eliminate the resistance as far as possible from the radio circuit.

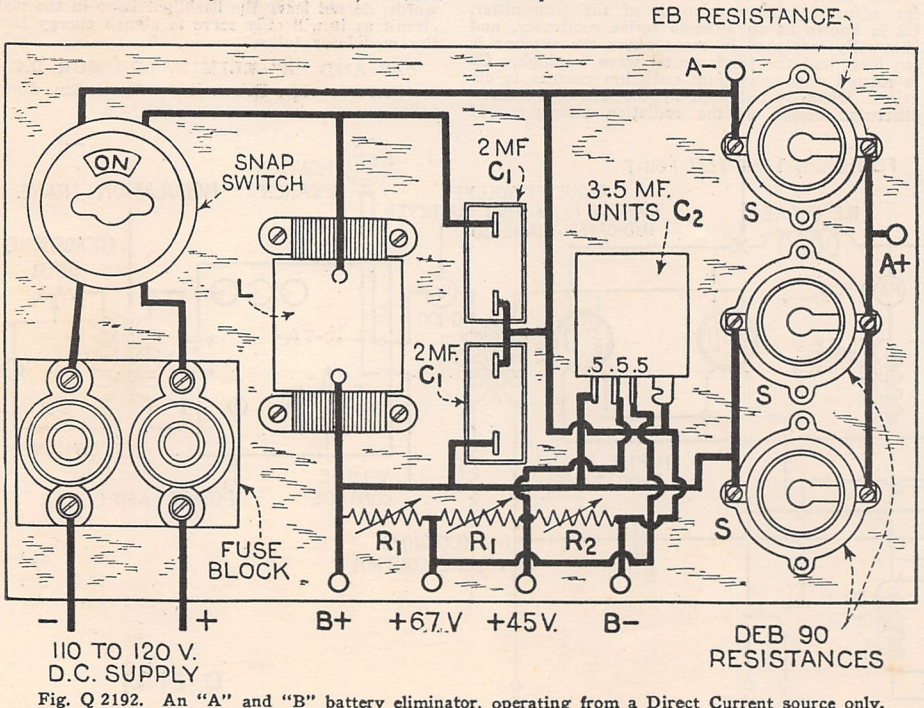


Fig. Q 2192. An "A" and "B" battery eliminator, operating from a Direct Current source only. The "B" battery voltage out-put is approximately 100 volts at maximum. By varying the amount of DEB resistances employed, any number of tubes up to 10 (201-A type) will be supplied with filament current (see the table, "Figuring the Resistances.")

Assembling the Varion

"The assembly of the unit is simple and the wiring self-explanatory from the accompanying diagram. Make all leads of No. 14 wire and be sure that they are as short and direct as possible. Solder each connection thoroughly and be sure that contacts in the bottom of the tube receptacles are clean. There are very few precautions to take in placing the Varion in operation on your receiver. The first and most important is to connect a fairly heavy condenser, such as an 0.5-μf., in series with your ground lead. This is to prevent burning out your tubes in case the polarity of the plug is incorrect when the unit is first put in operation.

"It is not necessary while using this unit to connect up the "B—" post on your set, as this is automatically a common connection through the eliminator. While the voltage from the eliminator at the filament supply tap is six, when all the tubes are in your set and lighted, it is very decidedly not 6 volts with only one tube in your set. When no load is placed on the circuit *the voltage jumps up to nearly 20*, and you are very likely to mourn the loss of a tube if you place it in the set without all its mates being in position. These simple precautions are really the only things you will need to give attention to while placing the eliminator in working order."

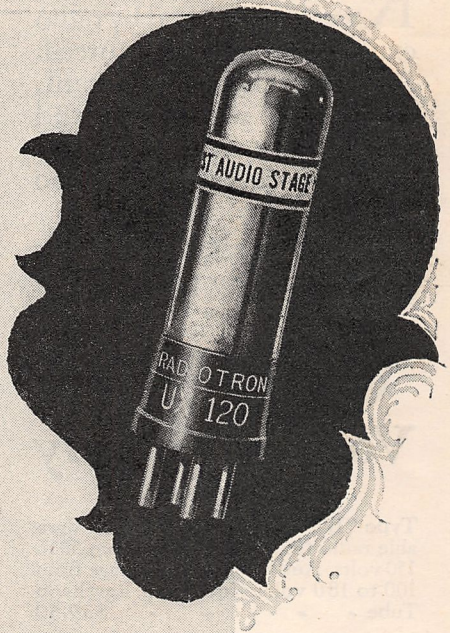
List of Parts

One Choke Coil (L), large current-carrying capacity (Amertran);
Two By-Pass Condensers (C1), 2.0-μf.;
Three By-Pass Condensers (C2), 0.5-μf.;
One Snap Switch and three Porcelain Sockets (S), 110-volt type;
One Porcelain Fuse Block, with two holders, and two fuses, 110-volt 10-ampere type;
Three Variable Resistances; two (R1), 0-50,000 ohms, and one (R2), 0-100,000 ohms ("B"-eliminator type);

(*Continued on page* 564)

RCA-power Radiotrons volume -without forcing

THE man who likes plenty of volume for easy listening usually has to drive the last tube of his set beyond its limit to get the music loud enough. And then it is no longer music. The RCA power Radiotrons are specially made to stand the strain in the last audio stage. They can handle plenty of volume without blasts or rattles, and therefore mean finer, clearer tone!



Dry battery power Radiotron UX-120 . . . . . $2.50

Storage battery or A. C. power Radiotron UX-171 . $6.00

Storage battery power Radiotron UX-112 . . . $6.50

Storage battery or A.C. super-power Radiotron UX-210 $9.00

Quality is a research story

The high quality of performance you get with a genuine RCA Radiotron is due to incessant research. The Radiotron laboratories find ways to make better tubes—they find ways to improve manufacturing processes—and they keep a constant check on the uniformity of the manufactured Radiotron. It pays to look for the RCA mark.

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RCA Radiotron

MADE BY THE MAKERS OF THE RADIOLA

Tested and approved by Raytheon Laboratories

Reliable—Noiseless Powerful

RIGIDLY tested, enthusiastically approved by radio experts and fully guaranteed. At last, reliable, constant, noiseless, uninterrupted power, right from your electric light socket, at a cost too small to be considered.

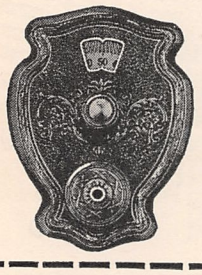
The greatest "B" Battery Eliminator ever produced.

Cornell
Voltage Supply
("B" Battery Eliminator)

Type "B" operates 1 to 10 tubes. Variable radio frequency voltage from 50 to 150 volts. Audio amplifier voltage from 100 to 180 volts. Including Raytheon Tube - - - - - - $39.50

Type "CB" (illustrated above) same as Type "B" with addition of variable "C" Voltage Supply giving from 1 to 40 volts. Including Raytheon Tube - $49.00

(West of Rockies, add $1.90 to above list prices)



Beautify Your Set

With its deeply etched plate, this new attractive smooth friction, 9 to 1 vernier dial will beautify your set and make it a 1927 model.

List price - $1.50

CORNELL ELECTRIC MFG. CORP.
135 East 58th Street, New York City

Please send full information about your Cornell Voltage Supply; also name of nearest dealer.

Name .....

Address .....

☐ If dealer, check here and receive special dealer proposition.

A "Superhet" Traveling Companion

(*Continued from page* 487)

be just large enough to allow the detector-oscillator tube to oscillate.

OPERATION IS SIMPLE

The operation of the set is not unlike that of the standard superheterodyne. When the tubes are in the sockets, and everything is ready, turn on the filament switch. The voltmeter will indicate the filament voltage; adjust the filament rheostat until the meter reads 3 volts. Now adjust the potentiometer until the intermediate amplifier just starts to oscillate. The proper settings of the tuner and oscillator will now bring in a station.

It is advisable to log all stations, as they can be tuned in at more than one setting of the oscillator dial, and you may be confused. As the loop is directional, the entire set should be rotated until the loudest reception is obtained.

Radio Wrinkles

(*Continued from page* 515)

side of base, solder the end of a length of the lamp cord, or battery cable, long enough to reach from the set to the battery, antenna, and ground lead-ins. This soldering is best done by drilling all solder out of the center of the prongs, pushing the bare end of the lamp wire through the prong from the inner side, and soldering at the tip of the prong, as it is done when the tube is made. After this is accomplished, the base is poured full of melted sealing wax around the wires, to give it a finished appearance. Then the loose ends of the wires are connected to their respective places on "A" battery, ground and aerial; remembering that the plug will push into the socket in only one position, necessitating care that the proper wires are connected to each place.

Before placing the set in its cabinet, a hole just large enough to admit the plug is cut in the back of the cabinet directly in line with the position the upright socket will assume. Then when the assembly is completed, the plug may be pushed into place from the rear, and all connections are instantly made.

In case the "B" battery is not placed in the cabinet, it can be kept with the "A" battery, and one terminal, as specified in the circuit used, connected to its proper terminal on the "A" battery. Thus by connecting the "A—" to the ground and the "B—" to the "A+" only four wires are needed for connection to the set; as, for instance, aerial, ground, "A+" and "B+". All batteries may be kept on the porch or in the basement, preferably as close to the set as possible.

Contributed by Lawrence Hercher.

TEMPERATURE CHANGES SIGNAL STRENGTH

That temperature influences the strength of radio signals is the conclusion reached by Dr. L. W. Austin and Miss Wymore of the Bureau of Standards, Department of Commerce. This work is a part of the program of the International Union of Scientific Radio Telegraphy, which was adopted at Brussels in 1922, and is now being carried on in the various countries belonging to the Union.

Two years ago Dr. Austin described a decided increase in the signals received at Washington from transatlantic stations during the passage of severe "cold-waves" over the eastern United States. Further study

FULL-AUTOMATIC
POWER SWITCH

PATENTS APPLIED FOR List Price **$5**

Forget Your "B" Eliminator

THIS SWITCH AUTOMATICALLY CONTROLS IT

100% AUTOMATIC CONTROL OF "B" ELIMINATOR AND TRICKLE CHARGER

When you snap off your set "FULL AUTOMATIC" turns off your "B" Eliminator for you — and of course when you snap on your set—turns it on again.

The Trickle Charger is also disconnected automatically when you are using your set, and is connected again when you turn the set off. Eliminates the HUM and regulates the charging. This switch can be used for either or both operations.

The Fire Underwriters now require that the "A" Battery circuit of EVERY RADIO SET be protected by a fuse. This feature is built into the FULL-AUTOMATIC switch.

IMPORTANT TO DEALER:
A FULL-AUTOMATIC POWER SWITCH should be installed with every "B" Eliminator sent out on approval to your customers. Should customer forget to turn off the "B" Eliminator, it will burn out the tube or condensers. Not only do you risk this loss, but the experience may discourage your customer from purchasing the "B" Eliminator.
The Full-Automatic switch is 100% Insurance For You

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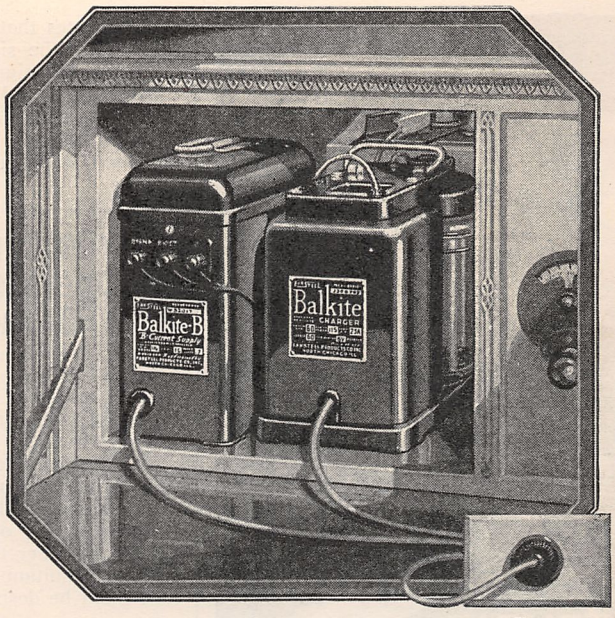
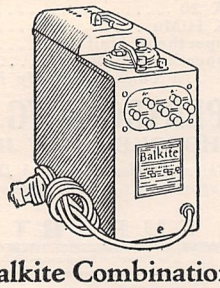


The new Balkite "B" *at* $27.50 *and the new* Balkite Charger *convert your radio set into a light socket receiver*

Balkite Trickle Charger

MODEL K. With 6-volt "A" batteries can be left on continuous or trickle charge thus automatically keeping the battery at full power. With 4-volt batteries can be used as an intermittent charger. Or as a trickle charger if a resistance is added. Charging rate about .5 ampere. Over 200,000 in use. Price $10. West of Rockies $10.50. (In Canada $15.)



Balkite Combination

supplies automatic radio power

When connected to your "A" battery supplies automatic power to both "A" and "B" circuits. Controlled by the filament switch on your set. Entirely automatic in operation. Can be put either near the set or in a remote location. Will serve any set now using either 4 or 6-volt "A" batteries and requiring not more than 30 milliamperes at 135 volts of "B" current—practically all sets of up to 8 tubes. Price $59.50. (In Canada $83.)

All Balkite Radio Power Units operate from 110-120 volt AC current with models for both 60 and 50 cycles.

To enjoy the convenience of a light socket set you need not discard your present receiver. Add the new Balkite "B" and the new Balkite Charger instead.

Balkite "B"—the unique "B" power supply—eliminates "B" batteries entirely and supplies "B" current from the light socket. The new Balkite "B"-W at $27.50* serves any set of 5 tubes or less where 67 to 90 volts are required. Balkite "B"-X at $42* serves sets of up to 135 volts and 8 tubes. Balkite "B"-Y at $69* serves any standard set.

The new Balkite Charger at $19.50,* with both high and low charging rates, is the most convenient of all methods of charging your "A" battery. At the low rate it can be left on continuous or trickle charge. Thus it automatically keeps your battery at full power. With heavy-duty sets, large sets, or sets in constant use where excessive "A" current is required, a few hours' operation at the high rate quickly brings the battery to full charge. This new charger gives you in one unit the advantages of both trickle and high-rate charging.

Both the Balkite Charger and Balkite "B" are entirely noiseless in operation. Both are permanent pieces of equipment, with nothing to wear out or replace. Other than a slight consumption of household current, their first cost is the last. Both are built to conform with the standards of the Underwriters' Laboratories.

Over 600,000 radio sets—one of every ten—are already Balkite equipped. Add these two Balkite Units to your receiver now. Then you too will know the convenience of Balkite Light Socket Operation. Then you too will know the convenience of owning a radio set always ready to operate at peak power. Ask your dealer.

FANSTEEL PRODUCTS COMPANY, Inc., North Chicago, Ill.

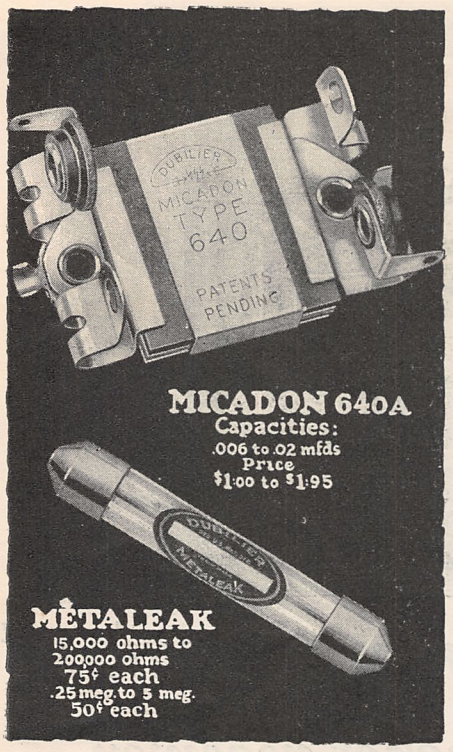
*Balkite Charger $20 West of Rockies. In Canada: Charger $27.50; "B"-W $39; "B"-X $59.50; "B"-Y $96.

Listen to the Balkite Radio Symphony Concerts

with Walter Damrosch and the New York Symphony, Saturday nights, 9 P. M., Eastern Standard Time, beginning October 23. Stations: WEAF, WEEI, WGR, WFI, WCAE, WSAI, WTAM, WWJ, WGN, WCCO, KSD, WDAF.

FANSTEEL

Balkite *Radio Power Units*



tone reality
need not be expensive

You don't need an expensive set to get faithful reproduction. Resistance coupling gives even amplification of all tones. And it has the added advantage of costing little, and consuming less "B" battery current.

Micadon 640 A is the Dubilier resistance coupling unit. It is a fixed condenser of the famous Micadon type, designed and patented by Dubilier to provide unvarying capacity with the lowest dielectric loss—so essential for the true reproduction of sound.

Used with the silent Dubilier Metaleak, Micadon 640 A will give you the foundation for an amplifier unit with all the tone quality found in the best radio sets.

Send 10c for our booklet showing fourteen ways to improve your set with simple applications of fixed condensers.

Dubilier
CONDENSER AND RADIO CORPORATION
4377 Bronx Blvd., New York, N. Y.

now indicates that whenever the temperature rises along the signal path there is a tendency for the signal strength to drop; and conversely, a falling temperature tends to produce a stronger signal, though these temperature effects are often masked by other unknown influences.

A Lamp-Socket-Operated Browning-Drake Receiver

(*Continued from page* 503)

spring bronze, eliminating any possibility of a noisy contact.

In order to secure good amplification of the low notes, which is essential for natural reproduction, mellowness, and volume, coupling condensers of large capacity are used. In this amplifier three 1.0-μf. units are used, and the resultant tone quality is everything that could be desired.

CONSTRUCTION OF THE RECEIVER

The construction of the actual receiver is indeed a simple task, as there are so few parts to be mounted and wired. The coils of the special Browning-Drake units, designed by Mr. Browning himself, are mounted on the condensers in a way to insure proper relations between the two coils (their axes must be in the same plane and at right angles to each other) and the proper spacing between the coils and condensers. If the coils were placed too close to the condensers, the resistance of the tuned circuit would be materially increased and the selectivity and sensitivity of the receiver would be considerably reduced. Thus, mounting the two condensers at the same time mounts the coils. Details can be obtained from Fig. 3.

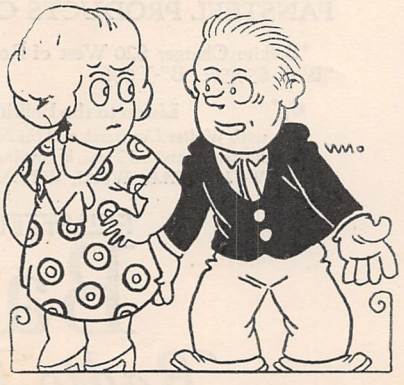
PREPARING THE PANEL

The panel on which the two Browning-Drake tuning circuits are mounted is of $\frac{3}{16}$" bakelite, 7 x 18". The holes should be carefully laid off on the panel with the aid of a scriber, pair of dividers, steel scale, and a square. When the positions of the various holes have been determined, as shown in Fig. 9 they should all be center punched and drilled for 6/32 screws. The larger holes are most conveniently made with a reamer; as few radio constructors are likely to have drills of the exact size needed.

MOUNTING THE PARTS

The filament switch, volume control and the two B.-D. units are mounted on the panel. It is wise to remove the red bulb from the pilot switch until after the set is complete

A DX HONEYMOON

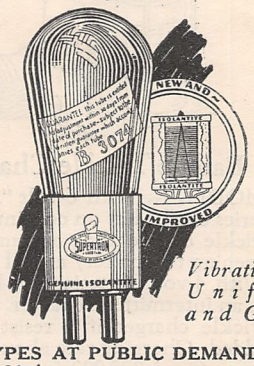


SHE: *"Marry you? Well, I should say not. You haven't even got a car, and you know how crazy I am about travelling."*
HE: *(hopefully) "Well, I've got a radio."*

THE TUBE WITH THE SENSIBLE GUARANTEE

Stop walking

He . . . "Please stop walking—I just missed the announcer—because your walking vi-rates these tubes and I can't hear anything but 'noises.'"
She . . "But dear, I must walk—We have no other means for conveying these dishes into the kitchen."
He . . . "Pardon me, you're right Honey, I didn't mean to speak so harshly—I guess I'll take Charlie's advice—your brother Charlie sure does know radio — You know, he had the same trouble—He tried all kinds of tubes without success —He even put sponge rubber under the sockets, but that did not prevent the tube elements from vibrating—So he went out and bought a set of those New Supertrons—They are internally re-enforced and rigid—Since then he and Maude dance and even Charleston without affecting reception"—
She . . "Now ain't that grand—You better get some Supertrons now—Be sure they are Isolantited—You'll see the difference."
He . . . "Alright Honey—I won't take anything *'Just as Good'* this time. I'll insist on Supertron because they are guaranteed by serial number and if I'm not satisfied the dealer will replace or refund within 30 days—So long Honey, will be back soon with Supertrons."



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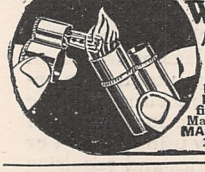
Master-Lite Pocket Lighter



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Westingale RADIO

The Last Word in Guaranteed Radio Sets and the Biggest Values Ever Offered

NOW!—These two brand new 1927 Westingale Radio Models are ready for you to try. New and far better in performance. Newer and much simpler in construction and control.

They are the last word in every way,—the finest, most up-to-date Radio Receivers on the market, embodying every new feature—and priced at just about half the usual cost.

Why not have the NEWEST Radio? Why pay high prices? Why take chances when you can put either of these last minute Westingale Models in your home for 30 Days' Trial on the absolute guarantee that if you don't find it the most beautiful and the most satisfactory Radio set for the money, you have ever seen or heard—you don't have to keep it.

Big -- Powerful -- Dependable 5-Tube, Coast to Coast Sets

Every late feature,—every new, worth-while idea is built into these two 1927 Westingale Models—yet 15 unnecessary parts and many feet of useless wiring have been discarded to simplify—improve—perfect them and eliminate your radio troubles. All we ask is a 30-Day Trial at our risk to convince you that this ultra simplicity really puts Westingale Radios years ahead of all others in powerful reception,—wonderful loud, clear tone—dependable service and EASY control.

THE UTMOST IN DISTANCE, VOLUME AND ATTRACTIVE APPEARANCE

Built in the new style, big, massive, period type cabinets, hand rubbed brown Walnut finish. The front panels enhanced with a beautiful Renaissance design, embossed in dull gold, these new Westingale Models are as pleasing in appearance as they are in performance. Either the 1-Dial or 2-Dial Model will reach out and bring you music, concerts, speaking, sports or market reports from hundreds of broadcasting stations all over the country with enough volume to fill your home. Unbeatable for performance, appearance or price.

Don't buy a radio until you get our FREE Catalog which fully pictures and describes these two newest of all radio models and explains our 30-DAY TRIAL OFFER. Don't wait—a special introductory discount for those who write quick. Mail the coupon today. Get posted before you buy.

Agents Make Big Money

We want agents in every locality to demonstrate and take orders for these amazing, low-priced, last-minute Westingale Radio Models. The easiest kind of work. Just like play. Quick sales and big profits. No radio experience necessary,—we show you how. This is your chance to get into the RADIO business for yourself without capital. Build a money making business of your own or a profitable side line in your spare time.

$50 to $100 a Week--Easy

FULL OR SPARE TIME

No home is complete without a good radio. Millions will be sold this fall. Get a Westingale set on 30 Days' Trial,—use it as a demonstrator and get your share of these profits. Demonstrate to your neighbors and friends, and see how the beautiful appearance, simple control, powerful performance and remarkable low price of Westingale models make them sell on sight.

Your Own Radio FREE

We also have a plan whereby you can put a Westingale set in your home on 30 Days' Trial and make enough demonstrations in your spare time to get your own set without cost before the trial period is up.

Special Discount to Agents

To quickly introduce these two wonderful new 1927 Westingale Models we are offering, for a limited time, a big reduction, way below retail prices on the FIRST Westingale outfit placed in each community. Don't wait. Be first in your locality and mail the coupon or a post card today for our FREE Radio catalog, special discount offer and full particulars.

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Mail Today - Don't Delay

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Please send me your FREE Catalog on the new 1927 Westingale Radio set. Also full particulars of your Special Discount offer on the first outfit placed in each community.

Name .....

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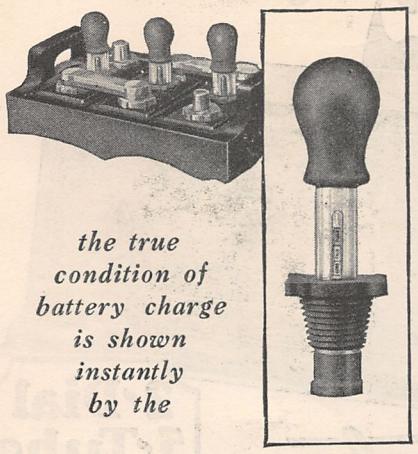
A New Idea in Battery Testing



the true condition of battery charge is shown instantly by the

SCRANTON
Battery-Cap-Tester

A REMARKABLE improvement that reduces several operations to one, and that the easiest one. No spilling of acid. No breakage of instrument. No soiling of hands or clothes.

Screw a Scranton Battery-Cap-Tester into each cell of battery in place of regular vent plug, and leave them there where they are always ready for instant testing.

To test, simply compress bulb and draw solution into tester. Three colored divisions—a special Scranton feature—show at a glance whether battery charge is GOOD, FAIR or POOR. When bulb is released, solution passes back into cell automatically.

Also tells when more water is needed—instantly, and without trouble of unscrewing vent caps.

Laboratory tested. Nothing that acid can injure. No adjustments ever necessary. Fully guaranteed.

Price $2 for set of three. If your dealer cannot supply you order direct from us.

TO DEALERS

The new Scranton Battery-Cap-Tester is a quick seller that has already taken hold in a substantial way. Be ready for a rapidly growing demand that is daily becoming more and more evident. Order at once from your jobber.

Manufactured by the makers of Scranton Kantstick Battery Testers and other precision instruments.

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Send Coupon For Free Copy of "Handbook of The Battery"

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Dear Sirs: Please send me free copy of "Handbook of the Battery."

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Dealer's Name .....

and ready to operate, as otherwise it may be broken. After all of the units have been mounted on the front panel, the two dials are attached.

The two tube sockets, self-adjusting rheostats, neutralizing condenser, grid condenser, by-pass condensers and binding posts are located on a 3/16-inch sub-panel or shelf, 6x7 inches. Two brackets may be made either from ½-inch brass strip, or as in the case of the set illustrated, from ½-inch angle brass; either will serve equally well. The standard brackets available on the market at present are not suitable for this use, as they are designed for use in sets with vertical instead of sloping panels.

When all the parts have been mounted the set is ready to wire; the diagram is shown in Fig. 7. As in the case of the power amplifier and "B" supply unit, it is advisable to use flexible, unvulcanized-rubber-covered (No. 18 equivalent) stranded tinned copper wire for connections.

The completed set is mounted in the front of the cabinet and the amplifier unit is placed in the battery compartment along with the "A" power unit and control relay.

These units are then connected together, as indicated in Fig. 6.

AERIAL AND GROUND

With the type of antenna coil used in the Browning-Drake receiver, it has been found that the most satisfactory length of antenna for ordinary use is about 75 feet, not including the lead-in. If the use of a longer antenna is preferred, then an antenna-series condenser (SC in Fig. 7) should be used. This condenser should be variable so that it may be so adjusted as to cause the two tuning dials to read alike. Once this has been done, no further adjustments of this condenser will be required. For this reason it is not mounted on the panel, but inside of the cabinet where its adjustment is not likely to be tampered with by anyone not familiar with its purpose. For best results with a short antenna, the series condenser should not be used, unless the receiver is located close to a powerful station.

Any type of lamp-socket-operated receiver requires a good ground. General experience indicates that the most suitable ground connection is obtained by connecting to a cold-water pipe with a good ground clamp. The surface of the pipe should first be well cleaned with emery paper or an old file.

OPERATING THE RECEIVER

The 199-type tube should be placed in the R.F. amplifier (rear) socket of the receiver and the detector tube (of a new type) in the front socket. The two "high-mu" and the type-171 tubes are placed in the three sockets of the resistance-coupled amplifier. The "BH" rectifier tube is placed in the remaining socket.

The panel switch may now be turned on and if everything is right the red pilot lamp and all the tubes except the 171 (and of course, the "BH") will burn. Plugging the cord of the central relay into the lamp socket will cause the 171-tube filament to light; and, if all is properly adjusted, broadcasting will be heard.

Assuming that the amplifier has been properly adjusted as described by Mr. Mayo and the writer in the October issue of RADIO NEWS, the next step is to put the receiver in proper condition. This is best done by tuning in on a local station. As the coils and condensers used have been built with the idea of having the two dials assume similar positions for a given wavelength, it is only necessary to rotate them simultaneously from one end of the scale to the other until a station is picked up. To facilitate this operation, the variable ratio levers on the two dials should be set for the same ratios. Any ratio between 6:1 and 20:1 is obtainable. When a station has been tuned in, the

TRY SELECTONE TRANSFORMERS at our risk!

We guarantee that SELECTONES will improve the performance of any receiver using Long Wave Transformers. Try them in your set. If they do not prove far superior to any transformer you have ever used, return them and your money will be refunded. Price each, $6.00.

DESIGNED by E. H. Scott, whose famous receiver—The World's Record Super 9—established new world records for consistent reception of stations located 6,000 or more miles distant.

SELECTONE FEATURES

SELECTONE Untuned Transformer—R400—has specially designed closed iron core, which limits interstage coupling and is impregnated in a vacuum so that all characteristics of coil remain constant. The coil design gives an extremely high amplification. You will be amazed at the improvement Selectones make in your receiver. Can be used in any circuit requiring a long wave transformer.

Either 199 or 201A Tubes Can Be Used

SELECTONE Tuned Stage Transformer—R410—is air core. Each transformer is matched to within one turn before sealing in case. The matching of these filters is so perfect that where extreme selectivity is desired, two can be used and are guaranteed to match perfectly. This is an exclusive SELECTONE feature.

RESPONSIBLE DISTRIBUTORS—We still have some desirable territory available. Write or wire today.
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Dealers looking for big turnover and quick profits will send for this 96-page catalog of radios and accessories, including Bremer Tully, Balkite, All American, G. E. Tungar, Thorola, Majestic, Utah, R. C. A. Tubes, nationally advertised parts, batteries, chargers, etc. Write for catalog No. 91H, full facts, territories open, etc. Tell us about your business, as we sell wholesale only. Real money waiting. Don't delay.

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SAVE ⅓ TO ½
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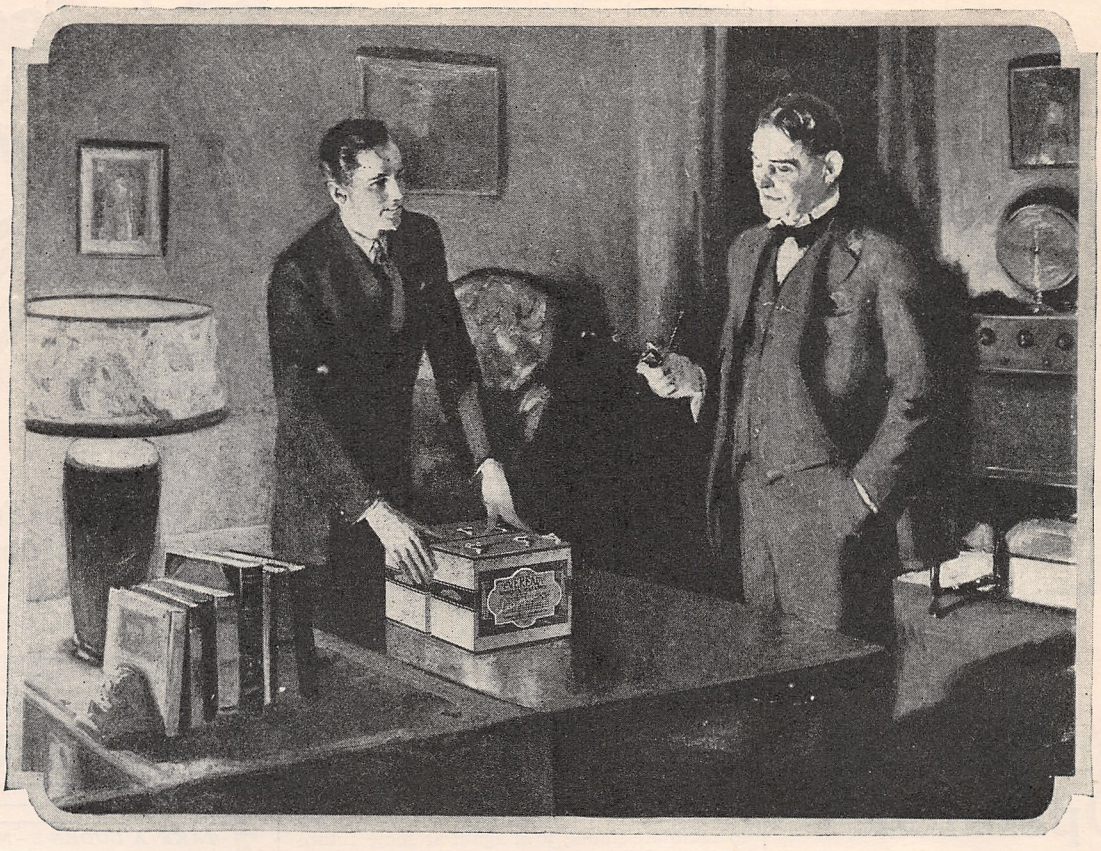

Here's the most economical "B" battery ever built for radio

IN THE production of Heavy-Duty radio "B" batteries Eveready has established a new standard of "B" battery life and economy.

Eveready Heavy-Duty 45-volt "B" Batteries will outlast any Light-Duty 45-volt "B" two to one regardless of the number and kind of tubes used! Moreover, though lasting twice as long, they cost only one-third more!

To cap the climax of "B" battery economy, in Eveready Layerbilt No. 486, Eveready has perfected a Heavy-Duty "B" battery of unequaled endurance and dependability—positively the greatest "B" battery in service and satisfaction its price can buy.

You can make no mistake in buying Eveready Layerbilt No. 486 for *any* set using normal voltages (45 to 135 volts).

You will be buying the utmost in dependability of "B" power—the lowest "B" power first cost—the greatest "B" power operating economy—D. C. (direct current) in its purest form, which insures pure tone quality.

With colder evenings at hand, radio reception is vastly improving. Equip your set now with Eveready Layerbilt No. 486, the greatest "B" battery ever built for radio.

LEFT—*Eveready Layerbilt No. 486.*

RIGHT—*No. 7111 Eveready Dry Cell Radio "A" Battery, 1½ volts.*

EVEREADY
Radio Batteries
-they last longer

Manufactured and guaranteed by
NATIONAL CARBON CO., INC.
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Canadian National Carbon Co., Limited
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Tuesday night means Eveready Hour—9 P. M., Eastern Standard Time, through the following stations:

WEAF—*New York* WGR—*Buffalo* WGN—*Chicago*
WJAR—*Providence* WCAE—*Pittsburgh* WOC—*Davenport*
WEEI—*Boston* WSAI—*Cincinnati* WCCO { *Minneapolis* / *St. Paul*
WTAG—*Worcester* WTAM—*Cleveland*
WFI—*Philadelphia* WWJ—*Detroit* KSD—*St. Louis*
WRC—*Washington*

Distantone

"Built By Craftsmen"

Light Socket Operated

This beautiful two-tone power console eliminates all batteries and other power supply units. Simply plug it into your house current light socket. Operation simplified by two vernier dial control. Equipped with the finest of loud speakers—THE AMPLION.

List Price Without Tubes

Model E Console with Power Unit...$275
Model E Console without Power Unit $165

Model C-Single Control Five Tubes. List Price $75

Walnut cabinet, hand-rubbed finish. Overall dimensions: length 17 in.; depth 12 in.; height 11 in. Three straight line frequency condensers mounted on one shaft are controlled by a vernier knob, which operates the stators of the individual condensers, bringing them into perfect alignment on any given wave lengh. Wave length range, 180 to 550 meters.

THE DISTANTONE LINE

In addition to the two models shown here, the Distantone line includes five tube receivers of two and three dial control and five and six tube sets with single dial control, all tuned radio frequency.

DISTRIBUTORS

Write or wire us today for the Distantone proposition.

DISTANTONE RADIOS INC.,
Lynbrook, Long Island, N. Y.

two variable plate-voltage controls (of the detector and radio-frequency amplifier) located on the side of the amplifier should be adjusted for best volume and quality. They are so located on the side of the amplifier that they may be readily reached through the small door of the console table, at the lower right.

The next step is to neutralize the radio-frequency amplifier. This may best be done by turning up the volume control (left) to its maximum point and the regeneration (right) control to a point just below maximum regeneration.

Adjust the right-hand dial to the point where the signal is loudest. Then rotate the left dial up and down the scale to a point above and a point below where the strongest intensity is heard. As the left-hand dial is rotated a squeal will probably be heard. By adjusting the neutralizing condenser, this squeal may be readily eliminated. The best means of varying the neutralizing condenser is to use a long stick with one end sharpened to resemble the point of a screw driver. The use of the screw driver or other metal tool for this purpose is not satisfactory as the effect of the adjustment will be altered when the tool is removed. Once the neutralizing condenser has been properly adjusted it will require no further attention unless some change is made in the circuit. As a 199-type radio-frequency amplifier tube is employed, the process of neutralization is quite simple and should not cause any difficulty.

Whenever a station is tuned in, its call letters may be recorded directly on the dials to facilitate tuning to it again at some future time. When it has been tuned in satisfactorily, the volume may be regulated by a variation of the volume and regeneration controls. In tuning for distant stations the use of regeneration results in increased sensitivity and selectivity.

For the sake of better acoustical results and ease in tuning, the loud-speaker should be placed in a different part of the room from the set itself. If desired, different cords may be run to several different parts of the house and the speaker placed wherever it is most convenient at different times.

THE FAN'S TROUBLES

(More truth than poetry—Jingle Editor.)

Here I am again tonight
Turning dials left and right,

Trying ere I "hit the hay,"
To get some station far away.

Ten o'clock and nothing yet!
Something's wrong with this blamed set.

"Trouble-shooting" now can start;
I'm bound to find the missing part.

Every wire seems all right;
"B" cells good and tubes all light.

Out at last to the aerial switch,
And now I've found what caused the hitch.

All the waves from the ether round
Are passing straight into the ground.

Next time I sit me down to tune
For some big station on the moon.

You bet your life I'l look and see
There's no ground between the sky and me!

—Contributed by Leslie D. Lowry.

THE "WOWSERS" MAKE GOOD

Australian broadcast listeners, as indicated by a popular vote, have shown a greater preference for religious programs than anything else. They cared the least for fashions.

Easy to Solder This New Way

Indispensable for all soldering work. Simple — Speedy — Economical

Pat. Applied For

$3.75 COMPLETE

Press-to-Feed Electric Soldering Iron

One hand does the work of two. Speeds up radio set construction. Far better than a blow torch. Solder will not melt until it reaches soldering point. Porcelain insulations prevents heat from entering handle.

Representatives—Dealers—Jobbers

This newly invented electric soldering iron offers big money making opportunity. Order a sample today $3.75. Discounts in quantities on request. Write to.

ILLINOIS STAMPING & MFG. CO.
220 N. Jefferson St., Dept. 12, Chicago

TAKE A LUDEN'S—MILLIONS DO

"I was about to broadcast when my voice went back on me"

188

Everyone who must depend on a clear voice and a trouble-free throat, will be interested in this letter from a well-known studio man:

"In 20 minutes I was to speak thru the microphone at WEAF. A coughing spell started. My throat was already badly irritated from smoke at a big fire the day before. It became worse and I was afraid I couldn't go on the air. Someone in the studio handed me a package of Luden's. I took one. The result was truly marvelous. It stopped the coughing and eased my throat. Later on, friends told me my voice came thru clearly." (*Original letter on file.*)

The exclusive menthol blend in Luden's Cough Drops gave quick relief over a billion times last year to sufferers from irritated throats, colds, coughs, hoarseness, etc. In the yellow package—5c—everywhere.

LUDEN'S MENTHOL COUGH DROPS

Yale The Perfect Ground **GROUND HOG INCREASES POWER AND DISTANCE**

Marvelous newly-invented ground gives incredably improved reception. Doubles power and distance users say. Reduces leakage. Stops jangling even in midsummer. Results never before equalled. Satisfaction guaranteed or money back at once.

Proven absolutely essential to clear, powerful distance reception. Draws and holds moisture indefinitely. Highly sensitive to radio energy.

SEND NO MONEY—To introduce, we offer to those who act at once, regular $5.00 size for only $2.00. Send name today and pay $2.00 plus 17c postage on delivery. Or send only $2.00 with order and save postage.

FREE—Full description of Ground Hog and details of amazing special offer on request—write today.

Yale Specialty Supply Co.
125 W. 4th St., Kan. City.

YALE GROUND HOG

Two-Speed Charging

What It Is—How It Works

This gives you trickle charge or full two-ampere charge

This charges "A" or "B" Storage Batteries

This disconnects unit from your set and puts battery on charge.

Four connections and it's hooked up

Colored balls show state of charge

Plug can be left permanently in socket without wasting current

Enlargement of control panel

The Willard Selling Plan for Radio Dealers

Your local Willard Service Station will act as your jobber on Willard Radio Products.

This means a quick source of supply for strictly fresh material which you can turn over to your customers in the pink of condition.

Your local Willard Service Station also assumes the responsibility for service, if needed.

Months of operation have proved that this plan is effective, and profitable for all concerned.

Willard Radio Products will be advertised extensively this fall. Doubles and full-pages in The Saturday Evening Post and other leading publications.

The Willard "A" Power Unit

AND "B" BATTERY CHARGER

Two-speed charging is a distinctive feature in the Willard "A" Power Unit. This very different Unit is wired so that the "A" battery receives *either* a "trickle" charge or a "two-ampere" charge.

Colored balls, which are readily visible in a sight gauge, always tell the owner which rate is needed. A two-way switch enables him to make his own selection of rates and to charge the "A" battery according to the current the tubes of his set have consumed.

Unless the owner deliberately disregards the story told by these balls there is never any reason why his "A" battery should lack power, nor does he have to depend on "trickling" to bring up the battery after prolonged use of this radio set.

WILLARD STORAGE BATTERY CO.

CLEVELAND, OHIO, U.S.A.

Have your local Willard Service Station explain the details of this practical plan for advertising and selling radio products. The advertisements are signed:

The **Willard Battery** men
and their
Authorized Radio Dealers

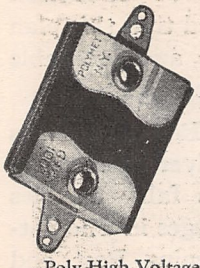
Appropriate signs and window cards will identify you as an Authorized Dealer. Booklets and other valuable selling helps will be furnished.

Your Nearest Willard Service Station is Your Nearest Willard Jobber

RESULTS!

Make Sure They Reflect Your Ability

The better the condensers you employ, the better your construction job. Polymet fixed mica and high voltage condensers are built to help YOU attain the perfect *results* which give complete satisfaction.



Poly Fixed Mica Condensers

Genuine Bakelite housing. One-piece lugs mean perfect contact and make soldering easy and quick. Individually tested. Capacities stamped, guaranteed accurate.

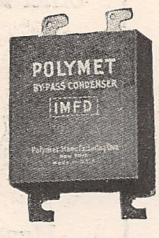
.00015 to .01 Mfd.
25c to $1.00

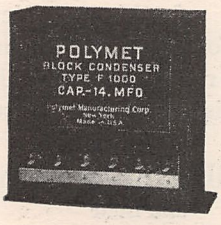
Poly High Voltage Condensers

Guaranteed 1000 V. Breakdown Test!

Incorporate finest insulating paper, best foil and specially prepared impregnating compounds. Non-inductive. High dielectric resistance for long life. Individual units or blocks—fixed terminals or flexible leads—in cans or unmounted.

.1 to 5. Mfd.
60c to $4.50





Raytheon Circuit Condensers

Polymet's special Raytheon Block Condensers have passed the Raytheon Company's Laboratory tests with high rating. Use them for best results.

Type F 1000, 14 Mfd.
$9.50

Type F 1001, .1-C-.1
$2.00

Over 125 receiver and power unit manufacturers specify Polymet Products as standard equipment. THEY KNOW! Follow the lead of the manufacturers—specify Polymet Condensers. At good dealers everywhere.

Write today for illustrated descriptions of all Polymet Products. Sent FREE on request.

Polymet Manufacturing Corporation
599A Broadway - New York City

"World's Largest Manufacturers of Radio Essentials"

POLYMET PRODUCTS

Radio Is Making Us Ear-Minded

(*Continued from page 469*)

minded—you have begun to get back to a more even psychological balance through becoming ear-minded again. You are learning, because radio has made you do so, to use your ears as they were originally intended, think and feel in terms of sound once more, as well as sight; and by just that much you are becoming a more normal and better human being.

The process is not finished, of course. You notice that whenever a broadcast speech, no matter how good, runs more than ten or twelve minutes, you begin to squirm; and when the fifteen-minute mark is passed, you fish for something else. That is because you have depended so long on seeing the speaker's face and gestures to renew your attention, that you feel the lack of these assistants when you can only listen to what he says. But that will change too, in time.

Whether television comes or not, in five more years you will be listening through your loud speaker to speeches as long as you ever heard direct from a platform, and enjoying every word; getting as much pleasure from a broadcast play—not in just one act with a two-character cast, but in three acts with a whole stage cast—as you ever did in a theatre. What is even more important you will be more alive and a better human being where radio is not concerned.

Right now, if you watch yourself closely, you will find your response to sound is better than it used to be; that you can "tune in" a friend's conversation through the roar of the street without having to look at his lips all the time; that the singing of a bird you can not see means more to you. When our children, growing up beside radio loud speakers, have had fifteen or twenty years of this training, we may look forward to a generation whose ears can do considerably more than hold spectacle bows.

Confessions of An Installation Grafter

(*Continued from page 471*)

formed him gravely. Taking an exactly similar battery from my bag, I switched the instrument to the *voltmeter;* and the indicator leaped to "4½."

"Too bad," I groaned; "you'll have to return this battery to the store. They'll replace it, but not for several days. However," as a bright idea struck me, "I can sell you this one of mine for 50 cents—"

"Much obliged. Sure; hook it up!"

I departed, enriched by a two-dollar tip, the price of the "new" battery, and the "old" battery, which had a perpetual resale value—like that of the tubes.

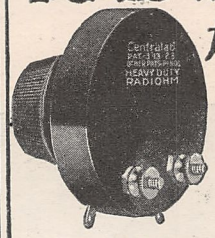
And so on with batteries, tubes, wire, improved lightning arresters, insulators, and any other of the innumerable parts of a radio set. The "improvements," simple as they are, solve difficulties which seemed grossly insurmountable to the uninitiated.

For a long time I secretly lorded it over my companions, who slaved for a paltry $25 a week—until one day I discovered they were all doing the same thing. It is not a pet scheme of my own; but a gigantic swindle perpetrated upon the most gullible of persons, the uninitiated and helpless radio bug.

SOS A FREQUENT NUMBER

Radio is coming in very handy during the West Indian hurricane season.

Heavy-Duty RADIOHM for Simple Control of B-Battery Eliminator



A single turn of the knob gives full resistance variation to control eliminator's output voltages. Permanent resistance as adjusted. Insulated for 1,500 volts. **Approved by Raytheon Laboratories.** Outlasts eliminator, giving full efficiency from it.

$2 at dealers, or from us.

Central Radio Laboratories
19 Keefe Ave., Milwaukee, Wis.

Australian Representative—United Distributors, Ltd., Sydney.
Canadian Representative—Irving W. Levine, Montreal.
Great Britain Representative—R. A. Rothermel Ltd., London.
69 standard set makers use Centralab variable resistances.

Centralab

$2.75

Silent "B" Power with World Radio Storage "B" Battery

12 Cells 24 Volts

Lasts Indefinitely—Pays for Itself

Dependable. Quiet "B" power, clear without "hum." Economy you have never before thought possible. Convenience. Outstanding performance. Recharged for almost nothing. Solid rubber case insures against leakage or acid. Extra heavy glass jars. Heavy rugged plates. Approved and listed as standard by Pop. Radio Laboratories, Pop. Sci. Inst. Standards, Radio News Lab., Lefax, Inc., and other Radio authorities.

Extra Offer: 4 Batteries in series (90 Volts) $10.50.

SEND NO MONEY! just state number of batteries wanted and we will ship same day order is received. Pay expressman after examining batteries, 5 per cent discount for cash with order. Send your order today—NOW!

WORLD BATTERY COMPANY
1219 So. Wabash Ave. Dept. 75 Chicago, Ill.

Makers of the Famous World Radio "A" Storage Battery
Prices: 6-volt, 100 Amp., $10.50; 120 Amp. $12.50; 140 Amp. $13.25. All equipped with Solid Rubber Case.

World STORAGE BATTERIES

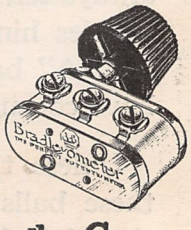
Set your Radio Dials for the new 1000-watt World Storage Battery Station, WSBC, Chicago. Always something interesting.

KDKA - WEAF - WGN - WJS - KHJ - KGO - KFAF - WJY - KOA

Bradleyometer

THE PERFECT POTENTIOMETER

Uses graphite disc resistors which are noiseless and not affected by atmospheric conditions. Metal parts are nickel plated. One hole mounting. Finish and knob match Bradleystat. Made in 200 and 400 ohm ratings.



Allen-Bradley Co.
Electric Controlling Apparatus
287 Greenfield Avenue Milwaukee, Wis.

MAKE MONEY EVENINGS

Let me show you how 4364 men, without experience add $25 to $75 weekly to their income without giving up their present position.
A. B. FISCHER, 122 W. Austin Ave., Chicago, Ill.

PERMANENCE

The Pharaohs Built for the Future

Kellogg Builds Radio Sets That Way

THE purchase of a Kellogg receiver is a *permanent* investment in Radio. The buyer of a Kellogg set will experience radio satisfaction that other people may not know for years, for Kellogg receivers have gone far ahead of others in the use of new and important improvements.

When you purchase a Kellogg set, you are providing for the future as well as the present. There will be no temptation to trade in your set for a new one which may later adopt some of the features that Kellogg gives you in 1926.

Inductive Tuning is one of the Kellogg innovations. It brings, for the first time, even range and volume at all wave lengths. It permits accurate tuning of four circuits with one hand.

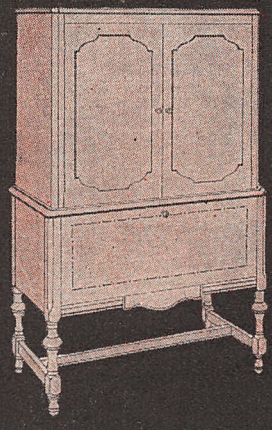
When you buy a set made by a solid, successful institution like Kellogg, you buy with full confidence that promises made *will be fulfilled.* Kellogg has been building telephones and switchboards for 29 years — and Kellogg will be here for years to come, standing back of the radio sets now being sold.

Write for folder describing fully Models 507 and 508.

Kellogg Switchboard & Supply Co.
Dept. 1-K, 1066 West Adams Street, Chicago, Ill.

Kellogg receivers are licensed under application for letters patent of Radio Frequency Laboratories, Inc. (R. F. L.)
Dealers and Jobbers inquiries invited.

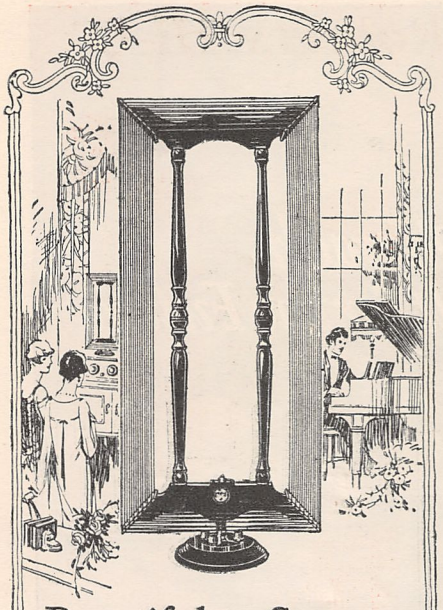
Model 507, 6 tube receiver, Kellogg's development of the sensational new RFL circuit. The acme of Selectivity and Musical Reproduction.



Model 508, the 6 tube Kellogg RFL in a beautiful walnut console, equipped with the Kellogg new, long air column speaker.

KELLOGG Radio

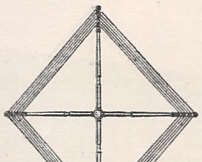
FLAWLESS REPRODUCTION



Beautiful to See Delightful to Hear

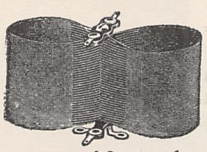
If you have not seen the Bodine DeLuxe Loop, you have a new thrill in store. The perfect symmetry and exquisite proportions of this beautiful loop harmonize with the most attractive home surroundings. Its remarkable efficiency combined with an overall size of but 12 x 26" is a pleasant surprise. The Bodine DeLuxe Loop is a decided aid to tuning in congested areas. By tuning out interfering stations and reducing static it improves tone quality. Ideal for loop sets. Write for circular telling how to secure the closer tuning and better tone quality provided by the Bodine DeLuxe Loop with aerial sets. See a Bodine DeLuxe Loop at your nearest radio store.

Bodine Folding Loop



The basket weave method of winding the Bodine Folding Loop provides unusual selectivity, longer distance and greater volume. The winding of fine stranded copper wires inside a silk braid is very efficient and designed to avoid stretching. Hinges of the English Mahogany frame are neatly concealed. Satin-silver dial makes logging easy. Bodine Folding Loop is 24" square, but when folded fits box 3½ x 6 x 18". Ideal for camping. Very attractive for home use. See a Bodine Folding Loop at your dealer's store.

Bodine Twin-Eight R. F. Transformers



This specially designed coil has been widely adopted by set manufacturers because of its unusual efficiency. The Bodine Twin-Eight method of winding provides greater amplification than is possible with any type of toroidal or doughnut coil with less interference with other parts of the set. Very compact, making assembly of set easy. Improves any tuned radio frequency hookup. Price $2.00 each. Set of 3 matched coils $6.00. Write for free wiring diagram of the Bodine Twin-Eight Receiver which utilizes these unusual coils.

Mail the coupon

BODINE ELECTRIC COMPANY,
2264 West Ohio Street,
Chicago, Illinois
Kindly mail FREE circular describing:
Bodine Radio Loops.
How to use a loop with aerial receiver.
How to build the Bodine Twin-Eight Receiver.

Name _____

Address _____

Correspondence From Readers

(*Continued from page 512*)

the loud speaker, KOA, WBAP, WCAE and WJZ with the Chicago stations on the air. Since then I have heard WSM, WSMB, WBAL, WRC, WJAX, WSUI, KDKA, WEMC, CWCX, WGY and WSAI. All these on the loud speaker.

I still get quite a bit of noise when receiving distant stations, but am trying to stop that by changing the variable resistance.

I am using a 2,000-ohm resistance at the present time with a 30-ohm rheostat on the detector tube, and a 6-ohm rheostat on the amplifying tubes.

This is the fourth set I have constructed.

HERBERT MAYROSE,
4119 Drummond St., East Chicago, Ind.

THE REGENERATIVE INTERFLEX

Editor, RADIO NEWS:

I have built the Regenerative Interflex shown in the December issue of the RADIO NEWS, and I am certainly in love with it. It beats anything that I have run across and I have been interested in radio since KDKA was in its infancy.

I have built everything from crystal to superhets but have found nothing to equal the Regenerative Interflex. At first I could not get volume but I added six turns to the secondary and shunted a .006-*μf.* fixed condenser across the "A" and "+B90v". Since that I get all stations as loud as the locals which are only 40 miles away. It is as clear as a bell and has a wonderful tone and now my 5-tube tuned radio frequency is in the discard. I am enclosing a list of stations that I received in one evening of distance hunting. Every station on this list came in with volume enough to be heard a block away and I can get KDKA and WCAE through the loud speaker on the detector tube.

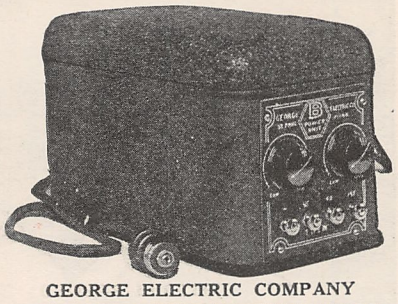
Notice how close it tunes.

Station	Dial Setting
WBAL, Baltimore	20½
WGHB, Clearwater, Fla.	25½
WDOD, Chattanooga	31
WJAS, Pittsburgh	33
WMAK, Lockport, N. Y.	34
WGR, Buffalo, N. Y.	34
WSM, Nashville	35
KFKX, Hastings, Neb.	36
KFOX, Omaha, Neb.	33½
WEAN, Providence	34
WORD, Batavia, Ill.	36
WOAN, Lawrenceburg, Tenn.	39
WMAC, Cazenovia, N. Y.	38
KFMX, Northfield, Minn.	39
KDKA, Pittsburgh	42
WGN, Chicago	40
WSMB, New Orleans	45
WJAZ, Mt. Prospect, Ill.	48½
WPG, Atlantic City	44
WREO, Lansing, Mich.	40
WLS, Chicago	48
WBZ, Springfield, Mass.	48
WSAI, Cincinnati	50
WCBD, Zion City, Ill.	54
WJAX, Jacksonville, Fla.	55
WJJD, Mooseheart, Ill.	57½
WEBH, Chicago	58
WGY, Schenectady	60
WTAM, Cleveland	61
WLIT, Philadelphia	62
WHT, Chicago	64
WLW, Cincinnati	68
WSB, Atlanta	67½
CNRO, Ottawa, Canada	70
WJZ, New York	73
WCAE, Pittsburgh	74
WBAP, Fort Worth	75
WOS, Jefferson City, Mo.	70
WMC, Memphis	78½
WEAF, New York	81

With my 5-tube set I am only able to get as far as Cleveland and this seems to be the same with everyone I talk to in our city. Me for the Regenerative Interflex.

M. C. CRATTY, D.D.S.,
Butler, Pa.

COMPLETE WITH TUBE $25.00



GEORGE ELECTRIC COMPANY

"B POWER UNIT"

"Type M"

Delivers the proper voltage at all times without a trace of a hum. Sturdily constructed to last as long as the best radio set. Its fine appearance will add to the beauty of your receiver.

A full wave rectifier tube is used—no filament to burn out. Three taps with two variable resistances permit complete control of both detector and amplifier voltages up to 180 volts. This gives ample power for any set on the market.

A George Electric Company "B POWER UNIT" will remove all your "B" worries.

LOWER PRICE—HIGHER QUALITY POSITIVE GUARANTEE

Sold direct from the factory to you, or through our authorized representatives. Write for complete information. Shipped prepaid on receipt of $25.00, or C. O. D. $25.00 plus postage.

GEORGE ELECTRIC COMPANY
753 Carleton Ave. St. Paul, Minn.

Agents and dealers wanted!!! Write for attractive agency proposition.

RADIO BOOK FREE

64 pages full of opportunity. Your guide to what's right and standard in Radio; full explanation of liberal offer paying agents $60 to $100 a week and how to get latest radio goods at wholesale.

Big Money In Radio

We want live dealer and agents in every locality. Lifetime opportunity. This Book more than a catalog—shows big profit way to get into world's newest and richest field—make big money—turn full or spare time into cash. **Accept This Offer!** Write for FREE book. Lowest prices—make 40 to 60% every sale. 5-tube Coast to Coast Receiver $39.50 Retail. Sells on sight. Hundreds of such money makers. Write for special agent's wholesale prices. Newest sets, parts and accessories—tremendous saving and profit. Write for FREE book and amazing offers.

Standard Radio Company, 1410 Walnut St., Kansas City, Mo.

World's Finest Loud Speaker

A three-foot cone speaker—unit developed by the inventor of the Tropadyne. Easily assembled, saving 80% of the cost. Complete kit with blue prints sold on rigid money-back guarantee—shipped prepaid or C.O.D.—$10.

Engineers' Service Company
25 Church Street, New York, N. Y.

You can be quickly cured if you

STAMMER

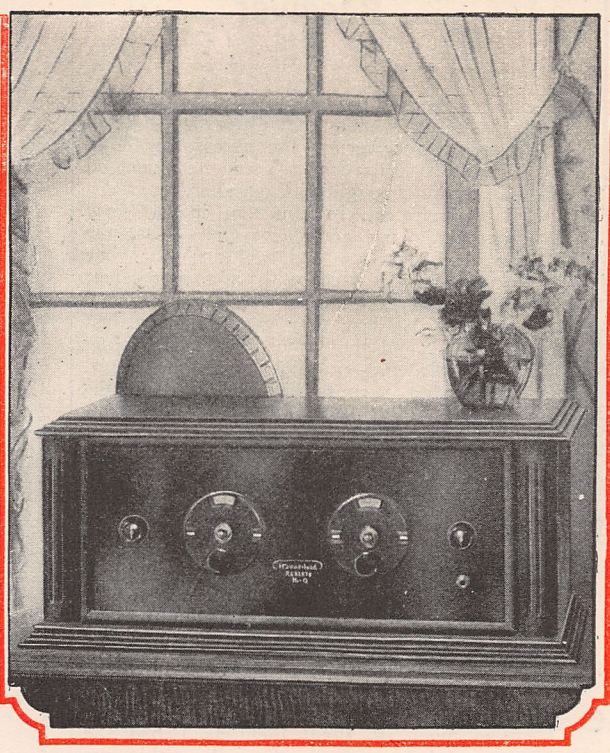
Send 10 cents for 288-page book on Stammering and Stuttering. "Its Cause and Cure." It tells how I cured myself after stammering 20 yrs. B. N. Bogue, 6961 Bogue Bldg., 1147 N. Ill. St., Indianapolis.

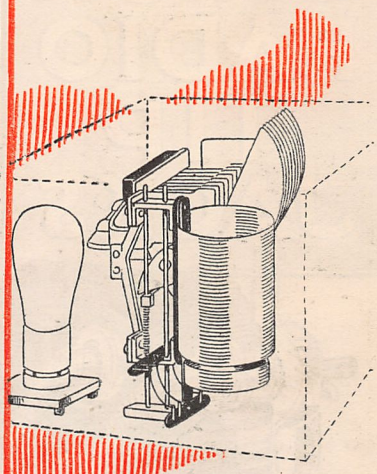
The New Shielded Hammarlund-Roberts Hi-Q*

"HOW TO BUILD IT" BOOK

Complete instructions for assembling, wiring and operating the Hammarlund-Roberts Hi-Q Receiver. Prepared under the direction of the Engineer-designers.

25c





Automatic Variable Coupling—same control operates tuning condenser and primary coil coupling simultaneously, gives maximum and equal amplification and selectivity over entire tuning range.

Stage Shielding—prevents coupling between stages, preventing oscillation and increasing selectivity. Clarifies reception.

Different And Finer Results From Different, Finer Engineering

THE new Hammarlund-Roberts Hi-Q is an entirely modern radio receiver, incorporating the latest approved features. The most important of these include dual tuning, stage shielding, automatic coupling variation, high detection efficiency, a high power output and that it is non-oscillating.

Tried and proven fundamentals have been adhered to; but they are applied in new and different ways that produce greater selectivity, clearer tone, simpler tuning.

This new Hammarlund-Roberts is the united achievement of ten of the leading radio engineers in the country; all concentrating on producing the most advanced and efficient receiver—regardless of cost.

YOU CAN BUILD THE HAMMARLUND-ROBERTS YOURSELF

Anyone can build the Hammarlund-Roberts Hi-Q. All the research, the selection of parts, the exact placing of units, has been worked out in advance for you. And you have a receiver that will equal an eight tube set—simplicity of design and operation hitherto unthought of—all at less than half the price you would pay for a factory made set of anywhere near equal efficiency.

HAMMARLUND-ROBERTS, 1182-C BROADWAY, NEW YORK

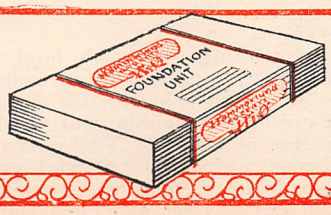
Hammarlund
ROBERTS
Hi-Q*

Parts complete (less cabinet) **$63.05**

*High ratio of reactance to resistance.
High ratio—Great selectivity—Loud signals.

HI-Q FOUNDATION UNIT

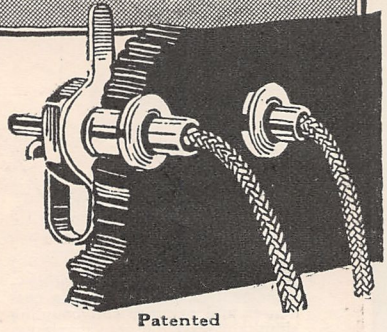
Includes drilled and engraved Bakelite panel, drilled Bakelite sub panel, two complete shields, hardware, wire, nuts and screws. ..... $10.50.



ASSOCIATE MANUFACTURERS

Carter Radio Co.
Martin-Copeland Co.
Radiall Company
Samson Electric Co.
Sangamo Electric Co.
Benjamin Electric Mfg. Co.
Eby Manufacturing Co.
Hammarlund Mfg. Company
International Resistance Co.
Westinghouse Micarta

UNION RADIO TIP JACKS



Patented

Save Time and Trouble

Connect your battery leads, aerial, ground and output wires to Union Radio Tip Jacks and be sure of an electrically perfect connection without loss. Plug in and out at will—no parts to loosen or lose. For temporary or permanent connections. Heavily nickel-plated they add to the appearance of your set. Used as standard equipment on many of the best sets.

25c a pair

Firmly grip all wires from No. 11 to No. 24 B & S gauge. Three sizes for all panels. TYPE A (Standard) for 3/16" to ¼" panels. TYPE B (Special) for panels, cabinet walls and partitions from 5/16" to ½" thick. TYPE C (Special) for panels up to ⅛" thick.

Ask your dealer for Union Radio Tip Jacks or write for Circular C.

DET + B

Identification Tags

These hard, red fiber ovals threaded on your wires prevent shorting battery or blowing tubes. Complete set of 9 tags only 10c.

TO ALL BRANCHES OF THE TRADE

Send for illustrated circulars and sample of these fast-selling radio products, and details of our attractive proposition.

UNION RADIO CORPORATION
124 SUSSEX AVENUE, NEWARK, N.J.
NEW YORK OFFICE 40 EAST 34TH STREET

The Diary of A Radio Receiver

(*Continued from page* 470)

charge me. Of course they're strange brands—but what's the difference—I've a real good receiver so the accessories don't make much difference. You'd be surprised how cheap I bought this speaker."

I tried to call to him that it was very important to use good accessories—that the man at the factory had said only the very best should be used with a fine receiver like me, but they couldn't hear, and I soon gave up. At last they connected the last little wire, and the same wonderful feeling came over me—no—not quite the same. There didn't seem to be the same smoothness, and I didn't have quite the same confidence of power.

I AM THE VICTIM OF FALSE ECONOMY

They moved the dials a little uncertainly, and the music began to come, but—what a difference. It wasn't so clear, and funny little noises kept interfering. It was so disappointing. I had a tendency to "howl." Finally I could no longer strain myself sufficiently to keep the music coming uninterruptedly. I broke off in the middle of a note, and the foreign noises gained in volume. I made another attempt but could not reproduce clearly. Something was missing. I wanted oh so much, to thrill them as I had the tester and his friend—the will within me was strong. For an instant the joyful surge of power would be with me, then the next instant a curious sense of weakness and I was unable to carry on.

My owner was so disappointed—said the whole thing was a fake—that the dealer had me specially doctored up to make a fine demonstration. Again I tried to tell them the trouble, but I guess it's useless for a receiver to try to tell human beings anything.

They played with me off and on for several days. I became so disheartened I hardly tried any more: the man was intensely displeased and kept saying he'd get even with the dealer for slipping him such a piece of junk. Despair was in my heart. I knew if I could only make him realize where the trouble was, we could be happy together, but it was of no avail.

A FRIEND SEES MY PLIGHT

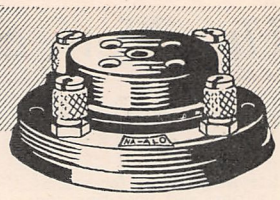
One evening a nice-looking man came to dinner. He had hardly entered the house when he asked my owner how his radio was working. Then my owner said some of the most terrible things—the dealer was crooked—the people who manufactured me were working a confidence game—the whole bunch should be in jail.

"Why, that's funny," said the visitor: "I've a radio just like yours, and for all-around performance it can't be beat. I'd be lost without mine. Let's look at yours—perhaps it's not connected up properly. Hmm! the connections are correct. Where's your hydrometer?"

"Hydrometer? What do I need with a hydrometer? More expense—I've spent plenty on that contraption—and I'll not spend another nickel. My batteries are all right. They're new, and the tubes still light up."

"Hmm! What kind of tubes have you? (lifting my lid to see them). Let's see your 'B' batteries. Where did you get the speaker?"

The visitor just shook his head for a few minutes and then, with a resolute air said: "John, I'm going to take the privilege of my long friendship with you to tell you a few cold facts. You've bought a darned good receiver, but an awful bunch of junk accessories. I'm sure the dealer who sold you this receiver didn't sell you these accessories. Two to one you bought the re-



Na-Ald Silencer Socket

A SOCKET with a perfected resilient mounting that floats the tube. Vibration is absorbed and microphonic disturbances eliminated. The action is up, down, sideways and pivotal. The only socket on the market with this feature.

Contacts press firmly against the entire length of the tube terminals. Triple self locking and flexing contact insures permanency.

Soldered lugs provide under panel means for attaching tube contact direct to set wiring. They can also be used for above panel wiring; or, removed and binding posts used for connections.

Round base of socket permits the placing of the terminals in the most suitable position. Edges of socket fit neatly to panel, Alden Processed Bakelite gives high insulation quality. Fits all tubes. Price 50c.

ALDEN MFG. CO., Dept. K21, Springfield, Mass.

Alden Processed NA-ALD Sockets and Dials

"B" BATTERY ELIMINATOR

Only $7.95

MONEY-BACK GUARANTEE

Stop being a slave to the "B" Battery nuisance! Throw the old-fashioned cells in the ash can! Hook up a new Roll-O "B" Battery Eliminator in 30 seconds and forget battery troubles forever. This wonderful device means better reception, sharper tuning. Ends that annoying hum. More real pleasure from your set.

mpletely Equipped --- No "Extras" to Buy

Operates perfectly on direct or alternating current, giving up to 90 volts current, and using the full wave of the power supply. Simple directions enclosed—anyone can plug it in to any kind of set up to six tubes. Constant voltage gives set more power without danger of burning out tubes. Costs no more than set of good "B" batteries. Solidly built in beautifully finished metal case.

Send $1.00

SEND YOUR ORDER NOW

Don't blame your set because run down "B" Batteries won't let it work right. Order your Eliminator NOW. Former price $12.95. Now cut to $7.95. Write name and address on a piece of paper, pin a dollar bill to it, and mail it TODAY. Pay postman balance ($6.95 plus a few cents postage) when he delivers your Eliminator. Use it ten days. If not more than satisfied, return it and get your money back.

THE ROLL-O RADIO CO.
Dept. 15, Third & Sycamore Sts., Cincinnati, Ohio

SAVE ⅓ TO ½!
Everything in Radio
WRITE for CATALOG—FREE
RANDOLPH RADIO CORP.
180 N. UNION AV. Dept. 2 CHICAGO, ILL.

Insure your copy reaching you each month. Subscribe to RADIO NEWS — $2.50 a year. Experimenter Publishing Co., 53 Park Pl., N.Y.C.

Instantly—they have set a *new* standard of what a tuning control should be

BRAND NEW... yet it is already the distinguishing mark of a 1927 model receiver.

Such is the reception accorded the MAR-CO illuminated control by leading technical authorities and circuit designers everywhere

... a reception paralleled only by the widespread acclaim which, a year ago, swept 500,000 MAR-CO vernier dials into use.

Today ... MAR-CO tuning is standard or optional equipment in virtually *every* important set-design of the season:

Cockaday's L. C. 27
Entirely MAR-CO-tuned, using the illuminated control and 2 MAR-CO rheostat dials.

Radio Broadcast's "LAB" Receiver
MAR-CO *controls standard equipment*

Radio News' "Auto-transformer"
MAR-CO *controls standard equipment*

Popular Science's 5-tube receiver
MAR-CO *dials standard equipment; illuminated controls optional*

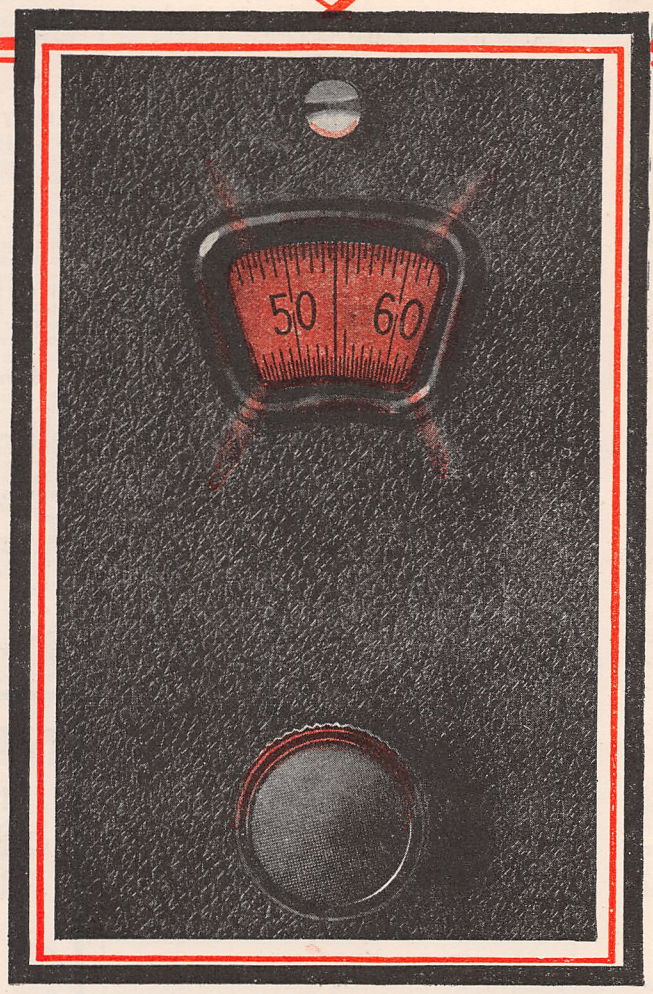
Citizens Radio Call Book's TRF set with shielded transformers
MAR-CO *controls standard equipment*
and the
St. James Super
MAR-CO *dial standard equipment*

Radio World's "Hi-Power" and Beacon Sets
MAR-CO *controls standard equipment*

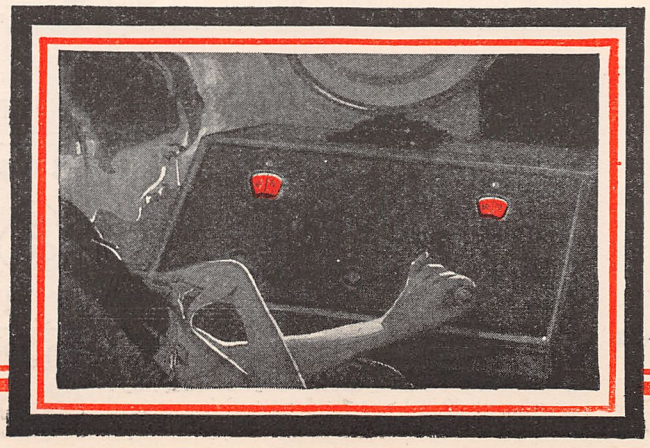
Radio Age's "Super-9"
MAR-CO *360-degree dials standard equipment*

Daven "Bass Note" circuit
MAR-CO *dials standard equipment*

Hammerlund-Roberts, 1927
MAR-CO *dials standard equipment*



MAR·CO *Illuminated* CONTROLS



The Radio Home's "VARION" A. C. set
MAR-CO *controls standard equipment*

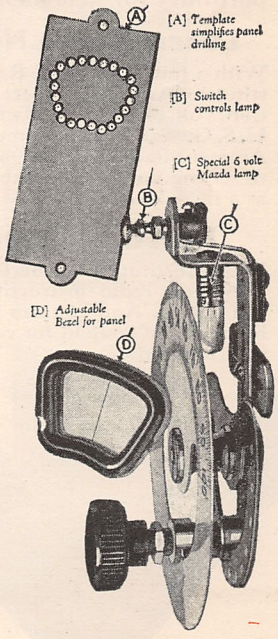
The "Infradyne" sponsored by RADIO
MAR-CO *controls optional*

The Fenway
MAR-CO *controls standard equipment*

Ferguson Single Control Receiver
MAR-CO *control built-in*

Let this impressive list be your guide when you select the tuning controls for the new set you build, or the old one you remodel. ANY set can have MAR-CO tuning. Write for booklet.

Martin-Copeland Company
Providence, R. I.



MAR-CO illuminated controls, (complete with template, bezel, and 6 Volt Mazda lamp) Scales 0 to 100, or 100 to 0, $3.50

MAR-CO vernier dials, 4 inch and 3 inch. Scales 0 to 100, or 100 to 0, *and* 360° vernier dials,
nickel plated $2.50
gold plated 2.75

MAR-CO 2 inch rheostat dial (matches vernier dials in appearance) ..... .75

3 reasons

for the golden opportunities for radio operators

1 Men who need money for college courses learn radio, take an operator's position with good pay, with free board and room. They quit as soon as they save enough for their purposes. *Opportunity for new men.*

2 Many operators find that it pays to learn radio for the pleasure of a few ocean voyages to foreign lands. Then they leave for shore jobs. *Opportunity for new men.*

3 Bigger and better positions that require technical radio knowledge and experience are constantly calling operators from the ranks. *Opportunity for new men.*

Learn Radio Now

With a few months of Radio Institute of America's expert instruction, you, too, can qualify for your U. S. Government Commercial or Amateur Radio License—and start to see the far corners of the world as a radio operator.

Learn at Home

Radio Institute of America gives the finest radio instruction you can obtain. And you can learn at home. Send coupon for complete information.

SEND THIS IN

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324 Broadway, New York City

Please send me full information about your Home Study Course of radio instruction.

☐ I am interested in the complete course including code instruction.

☐ I am interested in the technical course without code instruction.

Name----------

Address----------

Radio Institute of America
(formerly Marconi Institute)
Established in 1909
324 Broadway New York City

ceiver at one place and the accessories at another. Dealers who sell good receivers do not stock cheap accessories. Tell you what I'll do. I've my car handy, and I'll run home and get mine; then I'll show you how wrong you are about your receiver."

Within a few minutes he was back—I could tell by the way he handled me that he knew what he was doing. Finally all the connections were made—and O what a difference! I seemed to be back on the testing board at the factory. A twist or two of my dials—the music poured out—gee! it was a pleasure to have the right kind of tools to work with again. My owner could hardly believe his ears. "Why that's just the way it sounded when the dealer demonstrated it," he said.

"Certainly," said his friend, "when you purchase a receiver as good as this one, you should know better than to put cheap, second-rate accessories with it. Don't you know a receiver can't be better than its poorest tube; and poor batteries will make a prize set sound like a bunch of tin cans?"

MY TROUBLES ARE OVER

"Well," said my owner, "I guess the dealer was right. It's a pretty expensive lesson, but I'm going to get rid of all these accessories and buy some good ones."

Then the visitor answered: "When you do, you'll be more than pleased with your receiver. Your aerial isn't quite right, either. If you'll follow the manufacturer's instructions regarding antenna and ground, it will improve results, too."

Thanks to the visitor, my owner has purchased good accessories, my ground and aerial have been changed, and I'm just as happy as I can possibly be. I never refuse to work, because it's a pleasure to perform, and my owner swears by me. It was hard for a while, but everything is lovely now. Wish all receivers were treated as well as I am now.

"Came The Dawn"

(*Continued from page* 491)

perbolic characteristic curve on special graph paper possessing a very low specific inductive capacitance. Then asymptotes were constructed, the point of maximum response was located, and a new curve constructed to give uniform selectivity and perfect tone quality.

In calculation of the electrical constants there were consumed 27.5 bales of scratch-paper, 6.48 reams of graph paper, and six gross of lead pencils. The mathematical department furnished 68,954 cosines, 86,768 secants, and 33,682 tangents, besides 6,570 surds and 788 radicals. The chief engineer burned 23 barrels of midnight oil in 4,808 hours of overtime. The chemical laboratories produced a new kind of flexible glass and re-enforced rubber base, which resulted in a tube mechanically strong enough to withstand the shock of severe static or impact of transmitters. (During the filming of "South Sea Secrets" this tube made receiving possible through a heavy tropical thunder-storm when lightning made ordinary tubes useless; by wrapping the antenna lead around the tube the flexible shell absorbed the impact of static; the signals were drained off through a filter.)

The advertising department also felt the pressure of this unusual order; it was necessary to spread far and wide the knowledge that Czechseal was building a special tube, the like of which was never known since Dr. de Forest first operated upon an incandescent light bulb and produced the Eve of the present-day vacuum tube. To this end was purchased 39,788 yards of advertising space in 2,465 periodicals; so that little Jimmy

PRICES CUT

World STORAGE BATTERIES at Cost!

LIMITED TIME OFFER!

For a limited time only, genuine World Storage Batteries can be gotten at actual cost. Every cent of profit has been cut out in order to keep our full factory organization busy during the slack season. Prices below are lowest in history.

World Batteries are nationally known for dependable, long wearing performance. Solid Rubber Case prevents acid and leakage.

Send No Money!

Just state battery wanted and we will ship same day order is received, by Express C.O.D. subject to examination on arrival. 5% discount for cash in full with order. Send your order *now* and get your World Batteries at actual manufacturing cost.

WORLD BATTERY COMPANY
1219 So. Wabash Avenue
Dept. 10 Chicago, Ill.

2-Year Guarantee Bond in Writing

Approved and Listed as Standard by Leading Authorities

including Radio News Laboratories, Popular Science Institute of Standards, Popular Radio Laboratories, Radio Broadcast Laboratories, Radio In The Home, and Lefax, Inc.

Solid Rubber Case Radio Batteries		Solid Rubber Cased Auto Batteries
6-Volt, 100-Amperes $10.50	Set your Radio Dial for the new 1000 w. World Storage Battery Station WSBC, Chicago. Interesting programs every night.	6 - Volt, 11 - Plate $10.50
6-Volt, 120-Amperes $12.50		6 - Volt, 13 - Plate $12.50
6-Volt, 140-Amperes $13.25		12 - Volt, 7 - Plate $15.25

KDKA WSBC WEAF KYW

NION FIXED—RIGID DETECTORS

$1.00 — GUARANTEED —

Have built over 50 sets including 3-4 tube Grimes and used NION without a single failure. On straight Regenerative and R. F., I omit Grid Leak and connect 22 1-2 volts tap to crystal improving tone 100 per cent without affecting volume or distance. I have found no other so dependable. Sincerely, H. Peigh, 647 N. Lawndale, Chicago.

TOP NOTCH
RECEPTION AT EVERY POINT GUARANTEED

50c At Your Dealers or by Post

KEYSTONE PRODUCTS CO.
304 Gardenia Ave., ROYAL OAK, MICH.

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If you have an invention and desire to secure a patent, send for our Evidence of Invention Blank and free guide book, "HOW TO GET YOUR PATENT." Tells our Terms, Methods, etc. Send model or sketch and description of your invention for INSPECTION and INSTRUCTIONS.

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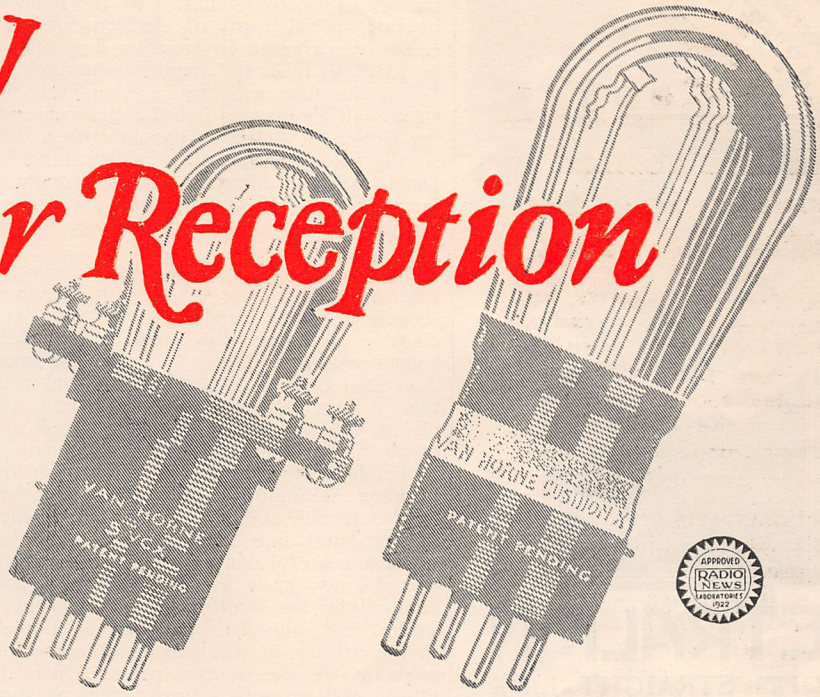
Cards, Stationery, Circulars, Paper, etc. Save money. Print for others, big profit. Complete outfits $8.85. Job press $11. $29. Rotary $149. All easy, rules sent. Write for catalog presses type etc. THE KELSEY CO., P-72, Meriden, Conn.

Buy *Better Reception

—You do that when You buy Van Horne Tubes



*BETTER RECEPTION

—The Experience of a Few of Many Van Horne Tube Users

Long Life

Buffalo, N. Y.

"At this time they have been given approximately 600 hours of service and they are maintaining their useful characteristics in a remarkably high degree."

Non-Microphonic

Harrisburg, Pa.

"The set was equipped with Van Horne Cushion 5 VAX tubes. Their installation eliminated all noises excepting those of summer static. As the night advanced and the static decreased the full value of the tubes became more apparent."

Clarity and Volume

Philadelphia, Pa.

"Let me congratulate you on the splendid performance of the Adapted Mogul 5 VCX Amplifier tube. I found these tubes give remarkable amplification and clarity. The tube actually gives considerable increase in volume when used without additional plate voltage or grid bias but when 135 volts is applied to the plate the volume is virtually doubled."

Distance

Minneapolis, Minn.

"The results of your tubes have pleased me so much that I feel it necessary to write to you and express my thanks. I wish that everybody knew the difference; I am sure they would never have any other type in their receiver.

"A friend of mine had been complaining of set as to long distance reception and asked me over to look at it. I went over and after carefully surveying his set found nothing wrong with it but suggested he try some of your tubes.

"The first evening after installing he received New York, Mexico City and several others he had never heard before with sufficient volume to be heard all over a seven room house. Now please remember the only change he made was in the tubes and that the others he was using were a well known standard type. Feeling this incident alone is enough to convince anyone I won't mention any of the others. They are too numerous. I will back these statements up as will several of my friends, to anyone who cares to write to me."

*Names of the above furnished upon request.

Van Horne tubes are built with but one purpose in mind—to give to the set user really dependable tubes—the kind that last long and serve him best.

The two unusual tubes above will make a decided improvement in your reception—they are built to give greater volume, realistic reproduction of voice and music and to eliminate vibration and other conditions that impair reception.

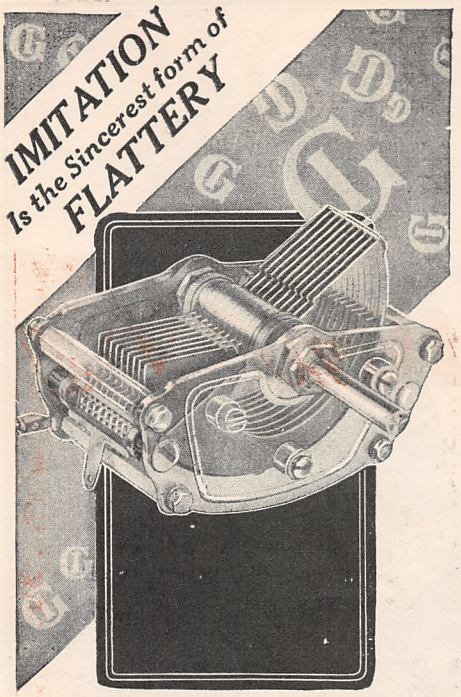
One of these, the Adapted Mogul 5 VCX power tube has unusual signal and current carrying capacity. Its use in the last audio stage gives to reception a fullness of tone and clearcut reproduction of voice and music—a great improvement in your set—without a change in wiring.

Another unusual tube is the Cushion Base 5 VAX. In the base of this tube is a soft rubber cushion which completely absorbs all vibration resulting in the elimination of harshness, humming and microphonic noises. Knowing how much vibration impairs the tone quality of reception fans everywhere are equipping their sets with cushion base tubes. Equip your set with Cushion Base tubes and note the surprising softness and fullness of tone of reception that follows the elimination of vibration.

To fully protect the user of Van Horne tubes an unconditional guarantee is made. This guarantee provides for the immediate replacement of any Van Horne tubes that in any way prove unsatisfactory.

The Van Horne Company, Inc.

1101 Center Street **Franklin, Ohio**



METRALIGN SLT

STRAIGHT LINE TUNING

condensers opened a new principle of station separation on all wave lengths by engineering design, and as usual created a trend that is being rapidly followed *but only in appearance.*

The METRALIGN SLT condenser was first publicly announced in May.

The definite principles on which METRALIGN SLT is based still remain the *exclusive* design that assures

Station Separation On All Wave Lengths

Those condensers claimed as being "just as good" are *not* good enough. Ask your dealer for the original and genuine.

FREE

We have prepared a most comprehensive booklet on tuning. It is written in simple language and tells all you want to know about condensers. Write for a copy today.

GENERAL INSTRUMENT CORP.

477 Broadway, New York

Makes Any Set a New Set--In 15 Minutes!

Juke of Peoria might know the details of the new Czechseal globe, and that Professor Billykin of Calabama "Tech" might mention in the course of his lectures that the number of electrons emitted by the filament of this special form of electron tube exceeded the average electrostatic flux density by 133,699.6 times the amplification constant. When the tube was finally completed, the Czechseal laboratories issued a commemorating edition of "Dandy Diavolo" tubes, personally autographed with a rubber stamp by Dandy Diavolo himself. These brought a large premium, and shortly afterward Dandy might be noticed driving a new Boils-Boyce.

In the cold radiance of this gray dawn the tube was functioning with its usual supersensitivity, and Dandy chortled an evil chortle. All over the land hoarse-voiced announcers were calling to action the great American citizenry, spreading far and wide the thrilling news that Rita Romanoff, the idol of millions, was abducted by hook and crook to an unknown fate. In many a peaceable home a family assembled for the morning setting-up exercises was shocked by this terrible tragedy; many a hard-boiled flapper burst into unaccustomed tears and many a peaceful merchant's eye grew moist and his jaw grew grim at this great loss suffered by the film-loving public; many a sympathetic film-distributor sobbed bitterly in the privacy of his business office at this stopping at the source of the lucrative stream of Romanoff pictures; many an amateur Pinkerton feverishly re-read his correspondence detective manual and polished up his shield and .22.

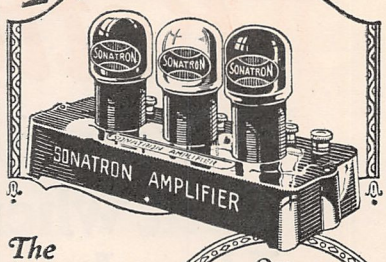
Everywhere the forces of law and order were galvanized into sudden action; posses combed the wild hills and subdivisions of Hollywood; newspapers co-operated, with height-limit headlines in extra after extra; Chambers of Commerce hastily assembled and fearlessly passed resolution after resolution deploring the sad situation, and pledging themselves, down to the last committee, to track to his lair the inhuman wretch who had thus deprived American youth of a great uplifting and entertaining influence.

In every corner of the land the public was gathering itself to institute the greatest organized search ever known since the disappearance of Angela Darling, the six-year-old princess of the Prune Trust, whose father, the president of the Prune Trust, with all its associated millions and far-reaching influence, had offered a reward of $5,000,000 and five hundred thousand packages of prunes for her safe return.

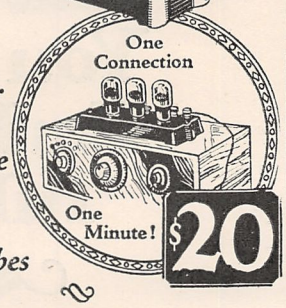
And now it was not a mere mercenary movement, with expectation of monetary recompense, which was so swelling, but the spontaneous demonstration of the great sympathetic heart of America, touched to the core by the loss of one of its loved ones. Already several European writers and professors of obscure and abstruse branches of learning were preparing paragraphs of caustic comment upon the "follow-the-leader sentimentalism" displayed in this typically American outburst; one of these was in the hands of an (American) newspaper syndicate, to be published for the satisfaction of the Great American Inferiority Complex.

But it was to the broadcasting stations, those most rapid and responsive mediums of information, that the public turned, and they continually reported most minutely the progress of the search. To a nation eager for news, and new news, they responded with every available or imaginable detail of information. What the police were doing, what the reporters said, who the abductor might be, every fact and every conjecture was instantly conveyed to the waiting millions. And at Tapioca, Dandy Diavolo, an evil smile on his thin lips, stood hearing

New!



The Sonatron Amplifier with 3 Red, White and Blue Matched PowerTubes



The Newest Product

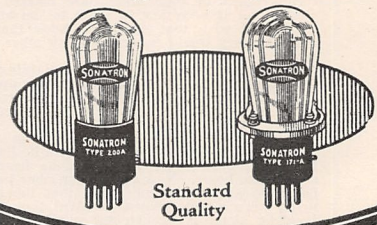
of the manufacturers of the largest line of RADIO TUBES in the world!

TO ADD 3 stages of amplification to any set, take one minute to make one single connection with the most amazing of all radio improvements—the **Sonatron Amplifier!** It will give you a new conception of tonal purity, and bring in distant stations with real volume and absolutely no distortion. Identify it by its Red, White and Blue tubes. See it at your dealer's—or write the nearest Sonatron branch.

May even be used on crystal sets, Also furnished for dry cell sets.

***Sonatron* type 400-A —Power Detector**
Replaces the old style 201-A and 200 and doubles volume and distance. One of **Sonatron's** 25 distinct tube types,

***Sonatron* type 471-A —Power Amplifier**
Replaces any 201-A without re-wiring. Used in last audio stage, its low impedance matches loud speaker, eliminating distortion.



Standard Quality

SONATRON

Products of
SONATRON TUBE COMPANY
Chicago, New York, Newark, N. J., Detroit
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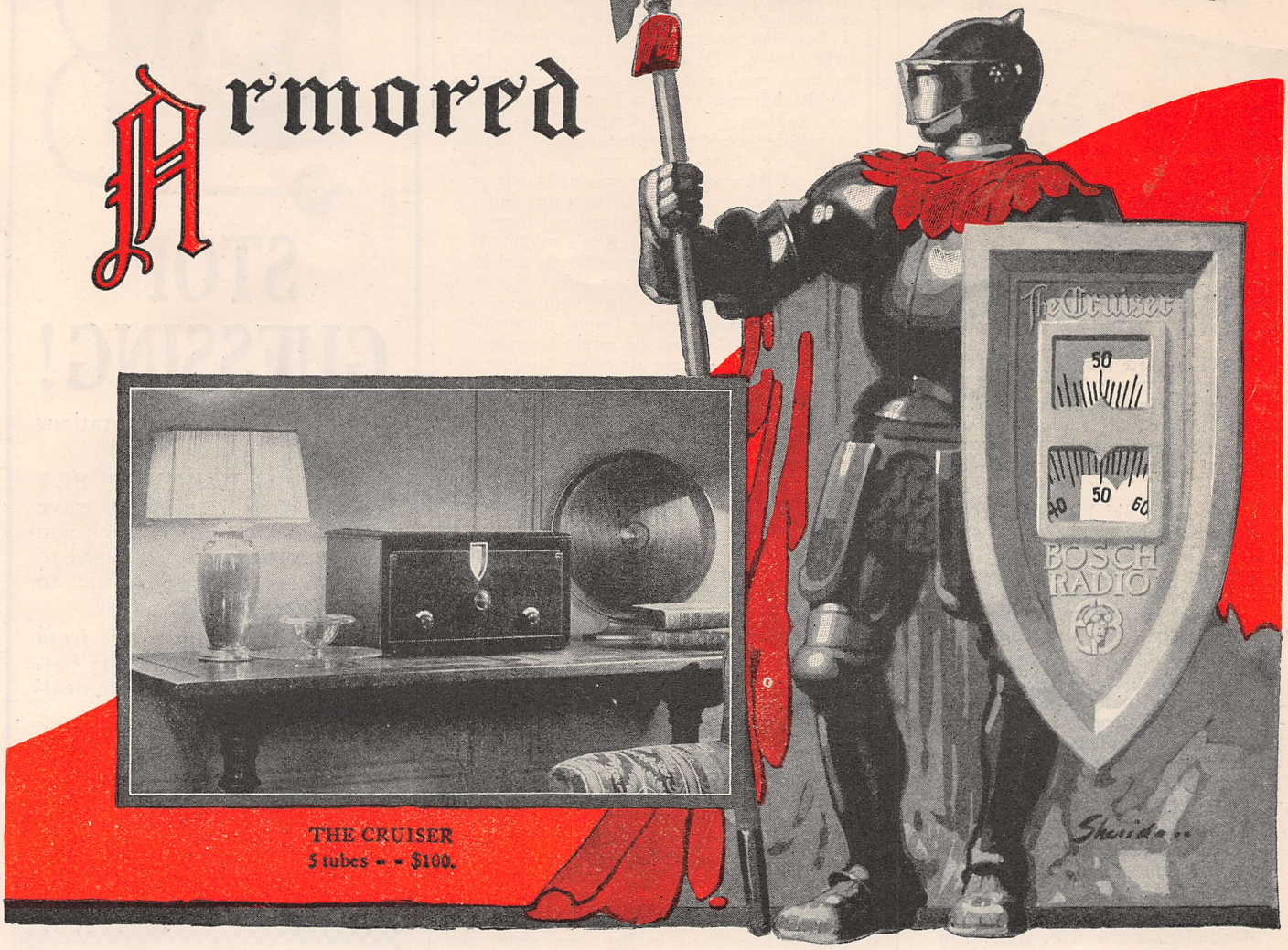
BOSCH RADIO

Armored



THE CRUISER
5 tubes - - $100.

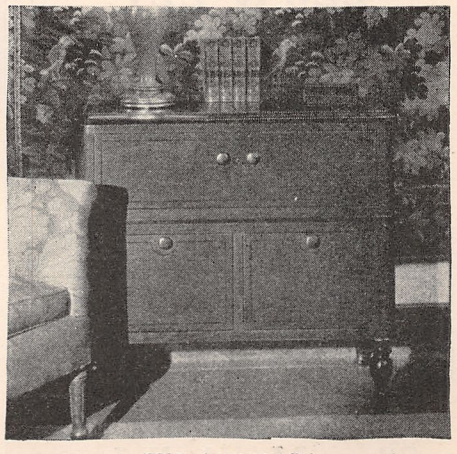
Perfect quality reception, tonal range, great power, penetration and simplicity of operation are the owner satisfaction features of the new Bosch Armored and Shielded Radio receivers. The embodiment of perfect radio and quality in furniture is particularly emphasized in the Amborada, a seven tube receiver, completely Armored and Shielded in a manner developed by Bosch engineers. It is controllable with a unified station selector. This receiver is incased in the early American period cabinet illustrated in this announcement. The Cruiser, is also a perfectly Armored and Shielded receiver, of five tubes. Complete with a control system of remarkable simplicity, one dial station selector for powerful stations and two dial advantages when "Cruising the Air." To hear Bosch Radio is to realize that another great step toward perfect home entertainment has been accomplished. Look for the Bosch Radio Dealer or write us for his name.

AMERICAN BOSCH MAGNETO CORPORATION

SPRINGFIELD, MASS. Branches: New York, Chicago, Detroit, San Francisco

Mftg. under patent applications of the American Bosch Magneto Corp. and licensed also under applications of the Radio Frequency Laboratories, Inc.

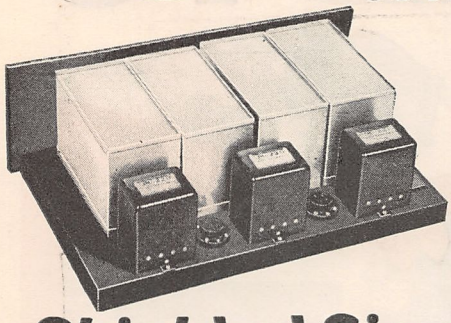
There are five, six and seven tube receivers in the new Bosch Radio Line. Two cone type reproducers, the famous NoBattry "B" Power Unit and other improved radio necessities.



THE AMBORADA
7 tubes - - - $310.

All prices slightly higher, Colorado and west and in Canada

SM 630



Shielded Six

The Shielded Six is one of the highest types of broadcast receivers. It embodies complete shielding of all radio frequency and detector circuits. The quality of reproduction is *real*—true to the ear.

Behind the Shielded Six is competent engineering. It is sensitive. Day in and day out it will get distance—on the speaker. It is selective. Local stations in the most crowded areas separate completely—yet there are but two dials to tune.

These features — its all-metal chassis and panel, its ease of assembly, and many others—put it in the small class of ultra fine factory built sets, priced at several times the Six's cost.

The SM-630 Shielded Six Kit—including all specified matched and measured parts to build this remarkable receiver — price $95.00.

The 633 Essential Kit—contains 4 condensers, 4 R.F. transformers, 4 coil sockets, 4 stage shields and the link motion—all laboratory matched—price $45.00.

Clear and complete instructions, prepared by S-M engineers, go with each kit—or will be mailed separately for 50c.

The Shielded Six has been approved by Citizen's Radio Call Book, Radio Broadcast and other prominent publications and newspapers.

220 & 221
Audio Transformer

S-M 220—the big, husky audio transformer you hear in the finest sets—the only transformer with the *rising* low note characteristic that means real quality—not only on paper—but when you hear it. It is a power job—yet this finest of audio amplifying devices is sold, with a guarantee for but $6.00.

The S-M 221 is an output transformer that will bring out the low notes on your present set. It should be used between the last audio tube and the loud speaker—it eliminates blasting and will increase speaker capacity for handling strong signals without distortion, $6.00.

Silver-Marshall, Inc.
848 W. Jackson Blvd., Chicago, U.S.A.

all; but who shall say that some spark of his long-submerged better nature, touched by some impassioned announcer's cry, did not kindle a flash of regret for the foul deed he was perpetrating?

Whatever emotion was passing through the consciousness of Dandy was, however, cut suddenly short. Rita Romanoff, at last succumbing to the great strain and stress of her harrowing experience, shrieked a shrill shriek. Dandy tore the phones from his head with a terrible curse. "Woman, wouldst kill me, to die a lone death on barren Tapioca?" For Czechseal, with its marvellous sensitivity, picked up and amplified many times the musical, sine-wave shriek of Rita, and to the ears of Dandy produced a shock sufficient to stun any but the most case-hardened of professional rogues.

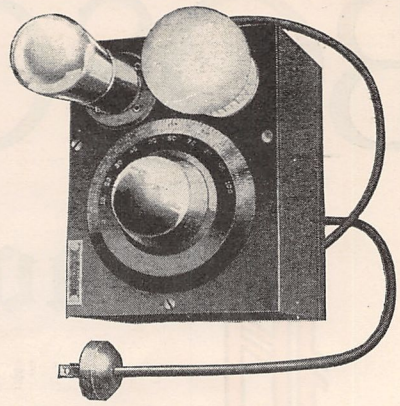
A thought flashed into Rita's mind. If a cry uttered by her in her ordinary shrieking tone could produce such an effect, a shriek with all the power of her well-developed lungs might easily render Dandy unconscious and at his awakening she might be speeding away in Diavolo's own air-coupe, turning the tables on him in a way worthy of the best of her twelve-reelers. But Dandy sensed the gleam of triumph peeping out between her dark eyelashes.

"Aha, viper, wouldst ruin me? The pretty bird must be better caged. A little gag, and her warble will change its tune."

He strode to the desk near at hand, and from the drawer removed one of a number of small cartons. From this he took a gag, not the old-fashioned impromptu handkerchief used as either neckerchief or a silencing device by the old-time Western villain, but a sanitary, individually - packed - and-wrapped apparatus, as efficient as modern science could produce; for Dandy prided himself upon employing the very latest methods. As evidenced, for example, by one of his quite recent pictures, "Red Radiation," in which a special beam-radio transmitter was modulated by a deadly red ray, to emanate from the loud-speaker of the well-known millionaire, Andrew Packard—in which plot he was neatly foiled by the timely installation of a green filter by Harold Dare, in the guise of a rising young radio engineer suing for the hand of Packard's beautiful daughter, worth millions in her own right, and heir to countless more.

Opening the carton, Dandy advanced toward his helpless victim, an ugly sneer twisting his cruel features. Rita realized the purpose of the monster, and uttered shriek after shriek of protest and denunciation, so that the phones fairly danced with the reproduction of her cries; with the fierceness of a wildcat she fought off his attempts to fasten the gag over her rosebud mouth; but with the superior strength and skill of the professional he overpowered her; unable to make a sound, she could only implore with her eyes that he remove the torturing gag. But Dandy's heart of stone was impervious even to such pitiful appeals. With a sneer, he replaced the phones upon his head, leaving beautiful Rita to suffer in silence.

At beautiful Abalona Island, gem of the briny deep, Colonel Watt was seated before his eighteen-tube hyper-superheterodyne, searching the ether for new foreign stations. The static was bad; and he found it necessary to fully advance the super-sensitivator before London was loud enough to be audible in the next block. A soprano was singing an operatic aria; she paused, gathering full breath, and started a brilliant run in augmented sixths, ending on high E-sharp, and courageously holding the tone at the risk of a sprained diaphragm. "About 1424," idly thought Colonel Watt; for in his youth he had been a piano tuner, and so always thought in terms of vibrations and concert pitch. He started. The singer's tone seemed to change, by about 18 cycles.



STOP GUESSING!

The wave length of stations are changing!

THE "SUPERUNIT" SET TESTER will tell you wave length of any signal which you receive. It also can be used to test a set. Indispensable to service men and DX fans.

This Tester operates from 110 volts A.C. without any batteries. Sold by up-to-date dealers everywhere.

$10.00

Hanscom Radio Devices
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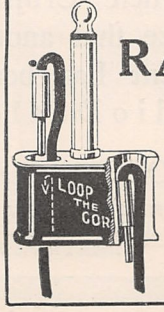
WOONSOCKET, R. I., U. S. A.

Bradleyleak
THE PERFECT GRID LEAK

Provides a noiseless range of grid leak resistance from ¼ to 10 megohms. Assures most effective grid leak resistance value for *all* tubes. Small grid condenser (0.00025) is separate. Metal parts nickel plated. One hole mounting.

Allen-Bradley Co.
Electric Controlling Apparatus
287 Greenfield Avenue Milwaukee, Wis.



A NEW RADIO PLUG

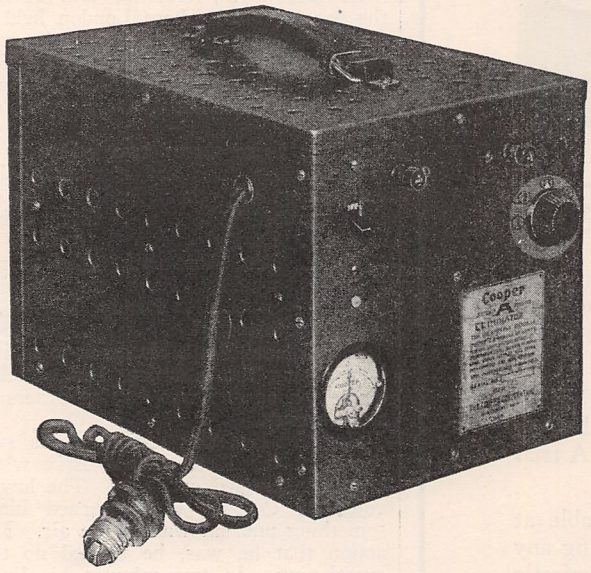
Simple to use, gives perfect electrical contact with any style tip.

Simply push cord tip through plug, loop cord and push tip back into plug. Sent postpaid on receipt of 50c

CULVER-STEARNS MFG. CO.
Worcester, Mass.

HERE IT IS! THE NEW

Cooper "A" Eliminator



Actually *Eliminates* the "A" Battery!

Operates Directly from the Light Socket!

No Battery to Bother with!

No Acids or Liquids to Replace!

Needs No Attention of Any Kind!

Good radio dealers in most cities have the Cooper "A" Battery Eliminator on display now. Price $87.50 (tubes extra), slightly higher west of the Rockies.

RADIO has been awaiting this day. The storage "A" battery with all its messy watering and charging has at last been totally eliminated as a radio necessity.

The Cooper "A" Battery Eliminator is entirely new in principle. It is unlike anything that has ever been offered the radio public. It actually *eliminates* the "A" battery with all its objectionable features—it operates *directly* from the light socket. The Cooper "A" Eliminator requires no attention of any kind—no battery to water or bother with—no acids or liquids to replace—none to spill and ruin costly rugs. It is not a power unit—it employs no trickle charger—it operates only while you operate the receiver. A simple throw of a switch and your current is on—tumble back the switch and the current is off.

The Cooper "A" Eliminator operates on any make or type of receiver using 6-volt tubes—it creates no noise of any kind—it gives you everything that batteries ever gave—and DIRECT from the light socket.

DEALERS—JOBBERS

The Cooper "A" Eliminator is the only device of its kind on the market. It has no competition. Limited distribution and full protection to trade outlets insure legitimate dealer and jobber profit. Write for full particulars of our exclusive proposition in your territory.

SEND FOR THIS FREE BOOKLET

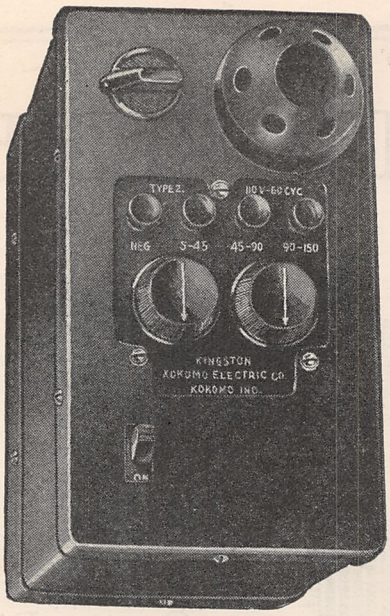
We have prepared a very complete illustrated folder describing the Cooper "A" Eliminator in detail. May we send it to you?

THE COOPER CORPORATION

Radio Division—Dept. N

CINCINNATI, OHIO

Now!



PRICE
Complete with Raytheon Tubes
$35.00

Kingston

B BATTERY ELIMINATOR

Do away with troublesome, expensive, bulky batteries, with acid, with stained carpets, with a dead radio just when you want it most. Install the KINGSTON B Battery Eliminator, and forget your battery troubles forever.

The Kingston Eliminator is compact, trim, handsomely finished in black and nickel, and guaranteed not only to remove the battery nuisance, but to deliver clearer tone and increased volume. A trial will convince you.

With the Kingston three different voltages are obtainable at the same time, each tap adjustable over a wide range, making any desired voltage from 5 to 150 possible and harmonizing perfectly with your own set. The Raytheon tube is used as a rectifier. The Eliminator operates without noise or vibration and will not heat, contains no acid or solution, is no trouble to operate and the operation cost is so low as to be negligible. It will not get out of order.

At Your Dealer's

Kokomo Electric Company
Kokomo, Indiana

Kingston

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A Guaranteed Radio Tube Within Reach of All

A tube for a dollar of $3 value. A trial order will convince you as it has thousands of others. (Blue or Silver with Bakelite Base). Send your orders at once.

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He listened intently. The tone was again pure and sweet, like that of a tuba in the cool morning at daybreak. Suddenly again sounded the discord. "A beat note," said Colonel Watt to himself, for his acute ear told him that something, somewhere between far-off London and beautiful Abalona was changing sweet melody into cacaphony.

The singer stopped, and through the silence was heard a wavering whistle like that of a distant radiocaster, except that it moved uncertainly, like the radiation of an ordinary blooper. But what distinguished it from the ordinary or garden variety of blooping was that through it sounded a rough growl. Plainly the wave was being modulated. The colonel disconnected the powerful loud-speaker and donned his custom-built head-phones. He grasped gently, but with the firm touch of an experienced operator, the ultra-fine vernier. The wave shifted back and forth, crossing and re-crossing the narrow band where London held forth. Finally it settled, and the modulation was unmistakable. Colonel Watt reached for the knob of his speech-clarifier, and with a light touch eliminated every trace of the carrier.

Voices there were: two voices in angry altercation—a man and a woman, the one denouncing, the other pleading. He caught the words, " . . . . thou didst it! . . . . Dandy . . . . soulless fiend! . . . . Rita Romanoff, listen to reason! . . . . wouldst leave me to die on Tapioca? . . . . Dandy Diavolo, thou shalt rue this day! . . . . unhand—"

But Colonel Watt, his quick mind instantly grasping the situation, had snatched up his telephone and was issuing orders like a stock-broker.

Harold Dare was dining in his suite of rooms at the Hotel Grand Prix when the telephone jangled excitedly. The low, tense voice of Colonel Watt warned him that something unusual was in the air. Man of action that he was, he wasted no time in questioning. In two minutes his limousine was at the door; in five he himself stood before Colonel Watt. In a few crisp sentences the colonel unfolded the situation and outlined the course of action. Already a fast launch was racing toward Tapioca, bearing a crew of grim-faced men, armed to the teeth and ready for any kind of desperate encounter; while in the colonel's hangar-garage a fast scout-plane was being made ready for flight.

Dare donned a heavy flying coat; the colonel rang, and a young man similarly dressed appeared. Five minutes later the two were circling above Abalona while Colonel Watt, seated in his radio room, directed both 'plane and boat toward Tapioca, where Dandy stood sneering at helpless Rita Romanoff, all unaware that the minions of law and justice were drawing tight the meshes of a net from which he might not escape.

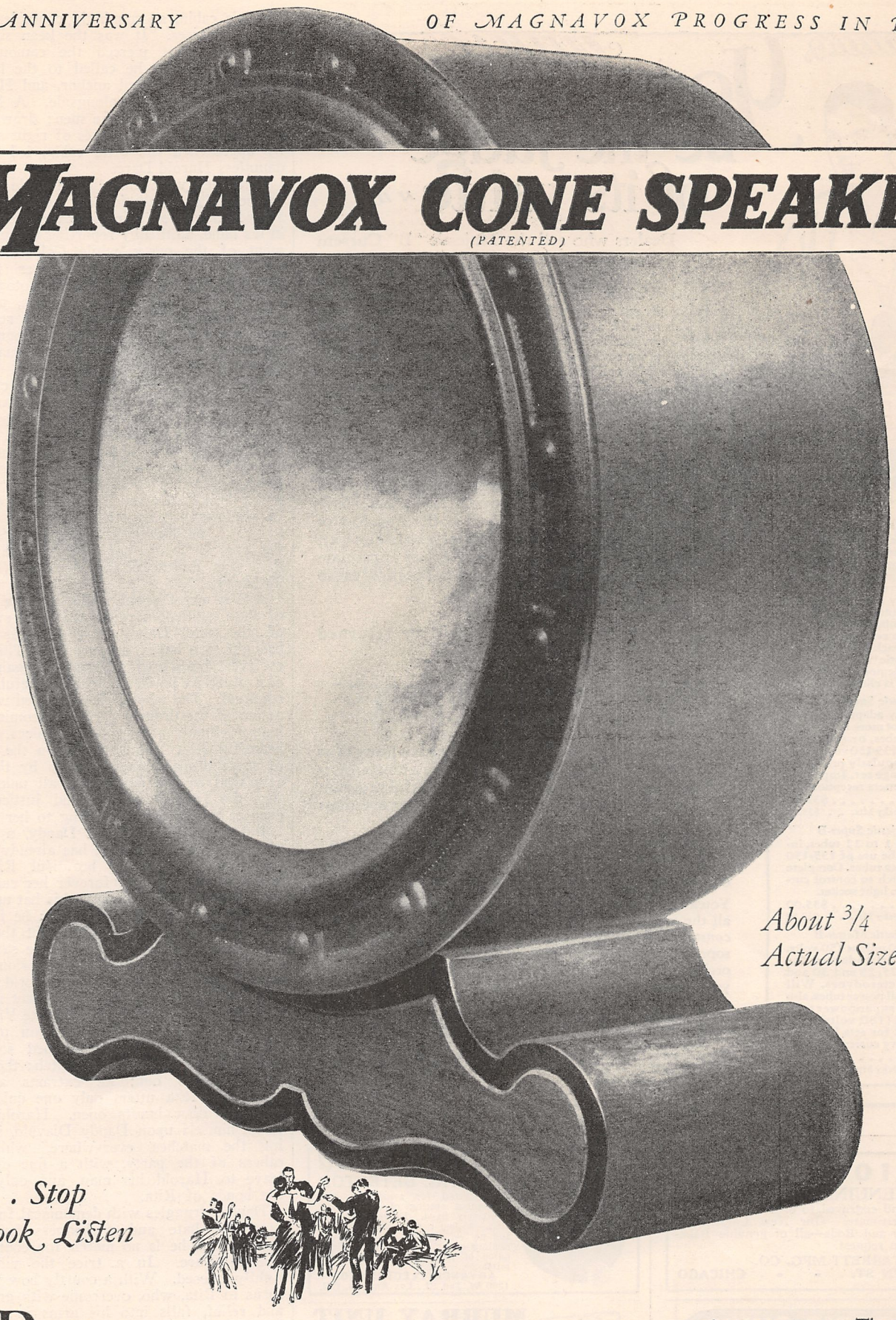
For the second time since its recent installation Colonel Watt rejoiced over his twenty-meter break-in system linking his plane and boat to his headquarters at Abalona. On 14,285.8 k.c., his own wave, he could hear the launch on 14,286.3 and the plane on 14,285.3; while the operators on each could hear the others simultaneously if desired, as the frequency difference of only 1,000 cycles placed all three easily within the audible range. On the plane everything was permanently locked in place, fixed capacities and heavy inductances insuring permanency of wavelength. But should the frequency change, a slight re-adjustment by Colonel Watt and the operator on the boat easily restored the relation, so that an ideal 3-way system existed.

While Colonel Watt checked the adjustments on his transmitters, his men were approaching Tapioca Island, and as the launch slowly circled the island, Dare and his pilot were straining their eyes for a trace of

15th ANNIVERSARY *OF MAGNAVOX PROGRESS IN RADIO*

MAGNAVOX CONE SPEAKER

(PATENTED)



About 3/4 Actual Size

. . . Stop Look Listen

RADIO as you've never heard it before. The complete tonal scale can now be reproduced—with magical realism. The *Magnavox* Cone Speaker does it. Every instrument in an orchestra is rendered true to type and tone—every note from the booming bass to the soaring treble.

This is a new, important advance in sound reproduction. Don't confuse this speaker with any other cone. It is made under our exclusive patents. It inherits the prestige and perfection that came from making the original loud speaker and 400,000 since then. *Magnavox* dealers now giving continuous demonstrations. The small one (Cornell model) pictured here is $22.50. A larger model completely encased in artistic mahogany cabinet is $35. They operate with and improve any set.

THE MAGNAVOX COMPANY
Oakland, California

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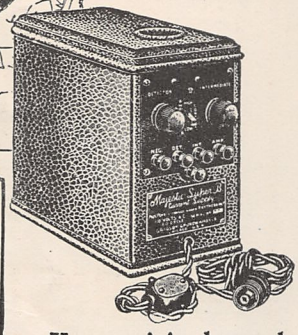
You be the judge of its value

Dealers who sell the Majestic "B" Current Supply are confident that it improves reception. So confident, they make you this unusual offer: Buy a Majestic today. Attach it to *your* set and use it for one week right in your own home. If, at the end of this time, you are not fully convinced that it gives you better radio performance *—more dependable power at less cost*—your money will be refunded!



Economical to Operate

You couldn't want a better proposition than this. The Majestic "B" Current supply, because of its unvarying constant voltage, gives you improved tone, greater volume—all at the low cost of about one-tenth cent an hour. So you can appreciate that here is a *practical* radio investment.

No Filament to Burn Out

All the Majestic "B" Current Supply units are manufactured complete in our factory and are equipped with the famous Raytheon Tube. (Endorsed by numerous radio engineers and editors) which is a non-filament tube with full wave rectification, no acids or back surge. Tests of the Majestic "B" on the oscillograph demonstrate that all A-C hum is eliminated.

Majestic Standard-B

Especially adapted for sets having not more than seven 201-A tubes, or six 201-A plus one 135-150 volt power tube. Popularly priced for the average set. Improves tone—betters reception.

Price $32.50
West of Rocky Mts. . . $35.00

Majestic Super-B

Capacity 1 to 12 tubes, including the use of 135-150 volt power tubes. Complete with switch to control current from light socket.

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Majestic Master-B

Rating 60 mils at 150 volts. Particularly adapted for Radiola 25, 28 and 30 and Super heterodynes. Will operate all power tubes, also the new super-power tube UX-171 (180 volts). Unequalled for sets having a very heavy current draw.

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Your original purchase price will be returned through operating economy alone.

Majestic "B" Current Supply

delivers pure direct current-From your light socket

Give that set of yours the power it needs—power for any variation in tone. Then you'll have a new appreciation of radio. You will have one delightful program after another—summer evenings—winter evenings *—ALL the time!*

That's when your set is equipped with Majestic "B" Current Supply. Your set seems *Alive* with marvelous energy. You sense a new joy in radio.

You at last forget its mechanics, for a simple switch releases all the power you need for any program. Power—*clean—constant—abundant!* Power that instantly responds to high soprano, and as easily brings you the full resonance of an orchestration! Easily attached to your light socket saving you constant bother and attention.

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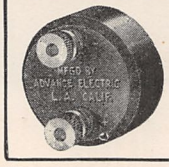
CRYSTAL DETECTOR



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Shows the latest circuits, the newest developments in radio at startling low prices. Get the parts you want here and save money. The best in parts, kits, complete factory-built sets and supplies. Orders filled same day received. Write for free copy NOW; also please send names of one or more radio fans.
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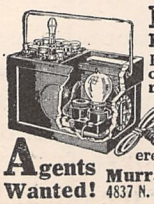
MURRAY UNIT
REALLY ENDS TROUBLE



For constant Radio "A" power; can be operated while set is in use. Simply connect to light socket. No adjustment; no wires to change; no low batteries. Equipped with hydrometer in cap for gravity test and 2-amp. G. E., Tungar bulb. Delivered ready to use. $29.50 LIST
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Experimenter Publishing Co., 53 Park Place, N. Y. C.

Dandy's cabin, so cunningly concealed by a clump of trees. It was the keen sight of Dare that first pierced the camouflaging canopy. Quickly he called to the launch; the boatsman dropped anchor, and Harold's plane swooped down alongside. A landing was spied by one of the men; drawing up and making fast, the forces of right stealthily approached the little cabin, led by the dauntless Harold Dare.

Two men were unreeling a cable leading to the radio installation on the launch, and a reporter was speaking into the microphone in his hand, faithfully reporting every movement of the party, while Colonel Watt's automatic modulator-rebroadcaster relayed all to the waiting millions. A photographer ground his motion-picture camera, and already a hydroplane waited nearby, ready to rush the film to the developing room, that the world might have immediate visual news of this great expedition.

The eyes and ears of the whole civilized world were turned expectantly toward this little island of the Pacific, where the forces of justice were staging the final scene of this great heart-stirring drama. (As great, some critics have held, as that recent Romanino-Dare super-spectacle, "The Big Pomade," which broke all previous box-office records; "a performance as strong in heart appeal . . . . as has ever taken place before the eyes . . . . of the American public," says Smith of the Watseka (Mont.) Tribune).

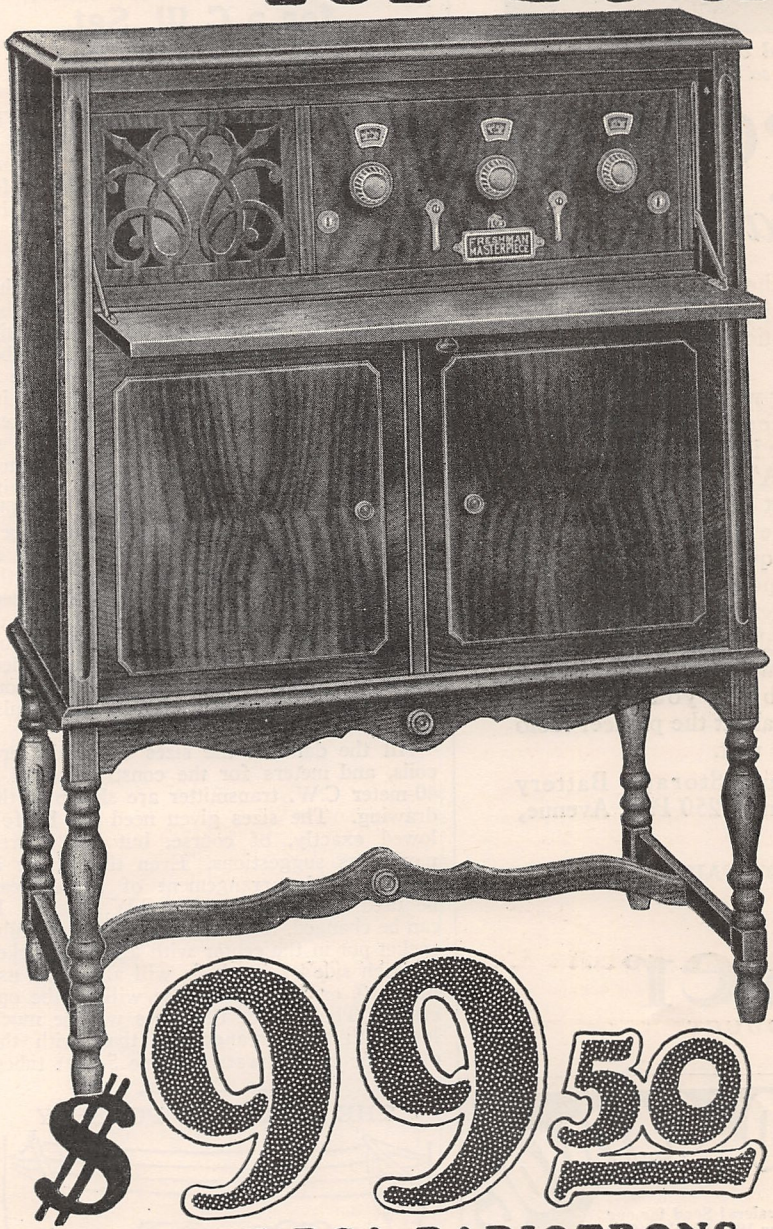
And it was through radio, and the efforts of those skilled in radio, that this evil plot of the vile Dandy Diavolo was being brought to a happy denouement! This newest great branch of science was again demonstrating its potential field of usefulness to mankind. The whole ether vibrated with the action of the drama which was coming to a happy climax at desolate Tapioca, where beautiful Rita Romanoff lay in the depths of utter despair, cheered only by the first few rays of the dawn, and all unknowing that the forces of right and justice were even at this moment speeding to her rescue.

But in the little cabin, Dandy, a triumphant leer upon his face, has already placed beneath the chair of beautiful Rita the bomb which is to end forever her career of defiance and scorn for him; his hat upon his head, he dons his fur overcoat; he fumbles for matches with which to light the fatal fuse, which will allow him to be safely on his reckless way before the explosion which projects Rita into the next world; Rita, hope fled, still maintains the defiant attitude which, since her first days with the Viograph studio in the infancy of motion pictures, has eaten into Dandy's warped soul; he finds a box; he strikes a match; the flame flickers, goes out; he extracts another, strikes it—Rita utters only one quick sob, and—the door bursts open. Harold Dare flings himself upon Dandy Diavolo, scattering the matches everywhere, while the others of the party, with a fine delicacy, leave to Harold his man, and only loose the bonds of Rita.

Dandy struggles with demoniacal fury, but years of hate and wickedness have left their mark; he is no match for courageous Harold Dare. In a trice the villain is tightly trussed. With a courtly bow Harold turns to Rita, who, overcome with gratitude and relief, falls into his arms in a faint. The cameras click; a microphone is shoved into Harold's hand, and in a few well-chosen words he modestly reports what has happened, while Rita herself regains consciousness long enough to murmur reassurance to her world of friends that all is well.

In every little hamlet and great city, from Topeka to Timbuctoo, from Tapioca to Tokyo, in every civilized clime and in wild Hollywood, millions upon millions of the admirers of Rita Romanoff vent their relief at the ending of the terrible suspense; while

A Beautiful Console for Your Home



New and Improved FRESHMAN MASTERPIECE

"THE ARISTOKRAT

A one-piece Console
of finely selected

Genuine Mahogany

One of the finest pieces of furniture in which a radio receiving set has ever been installed. It is truly an aristocrat with its distinctive, finely proportioned lines and rich lustrous finish.

***Equipped with the finest of* CONE SPEAKERS**

especially designed to bring forth the full merit of the new construction of the Freshman Masterpiece circuit. Designed for the employment of the new UX-112 Radiotron Power Tube and the necessary "C" battery connection—all metal SHIELDED front and sub-panel.

Sold on easy terms by Authorized Freshman Dealers, who also install and service them

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FRESHMAN BUILDING, NEW YORK
2626 W. Washington Blvd., Chicago

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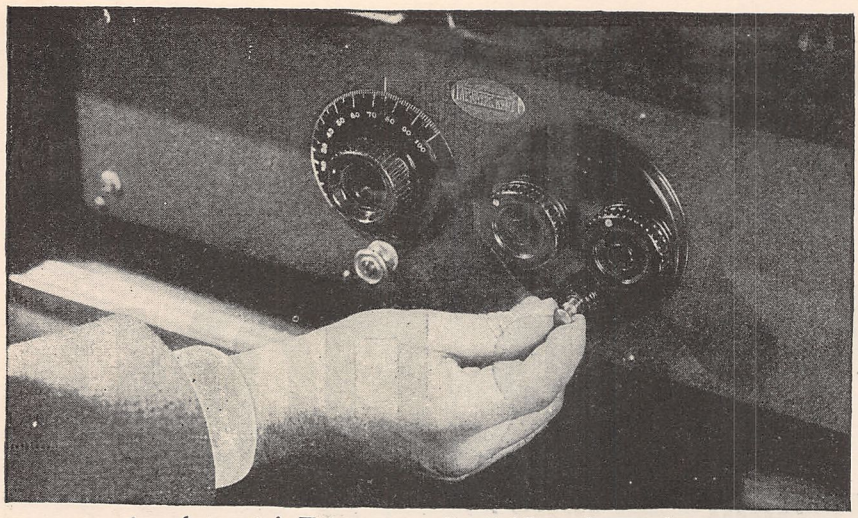
GENUINE RCA RADIOTRONS

are recommended for use with Freshman Masterpiece Receivers. A special package containing—1 UX 112 power tube, 1 UX 200A detector tube and 3 UX 201A amplifying tubes—matched and tested for the set in which they are shipped, is sold by Authorized Freshman Dealers.

Write for our beautiful new booklet illustrating and describing our 1927 Receivers and Accessories

The World's Great Radio!



Automatic! Unipower supplies "A", and controls "B" power, automatically *at the click of the set switch.*

Rich RADIO POWER
that cannot fail

DOES this sound like magic? . . use your radio set night after night, yet never have your "A" power fail! . . . It probably reads like a fairy story to most radio users, but that is identically the kind of performance Unipower makes possible from *your* set!

Never again need you approach your set fearing that the "A" battery has run down—or worn out. With Unipower you click on the radio set switch with full confidence that it cannot fail. *And Unipower never does!*

Three simple motions in three minutes make Unipower a *permanent* part of your set. Hook two wires to your set, plug in on a light socket, and Unipower is connected. Then—forget completely "A" batteries and the trouble they cause. Begin to enjoy the thrill of undisturbed reception that only Unipower can give.

Unipower was designed by expert radio engineers. It first converts your electric light current into perfect radio "A" power. Then, more important, it feeds that power to your set in the exact amount required for highest quality reception at all times. Unipower contains a Balkite trickle charger of Gould design.

Any reliable dealer will demonstrate Unipower for you. Or a postcard will bring you complete information about the pioneer radio "A" power unit.

The Gould Storage Battery Company, Inc., 250 Park Avenue, New York.

RADIO "A" POWER THAT CANNOT FAIL

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BIRNBACH BATTERY CABLE
SIMPLIFIES THE CONNECTING OF RADIO BATTERIES
SEPARATE COLORED WIRES
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ALSO MADE IN 6-7-8-WIRE CABLES

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20 ft. Extension Cord with Connector $1.00
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at Abalona a great multitude gathers like magic, to await the return of their beloved idol. And as the dawn lights the east with rosy promise, Dandy Diavolo, helpless in his fetters, realizes that in the end, in life as well as every scenario, right must triumph over evil. In Dandy's own air-coupe, his intended victim and her triumphant rescuer are rising into the air; in their ears sound the congratulations of Colonel Watt, while the rescue party showers the blissful couple with cheers and the rice thoughtfully provided by their prudent benefactor.

Harold smiles at Rita, Rita smiles at Harold, and the clouds slowly hide the two from view.

FINIS.

Socket Arrangement for a C. W. Set

(*Continued from page* 518)

ped auto-transformer can be used (as in Fig. 2B.) The operator must be certain *not to forget to reduce the filament and plate voltages* when the small tube is substituted for the large ones, or he will be spending all his money buying new five-watters.

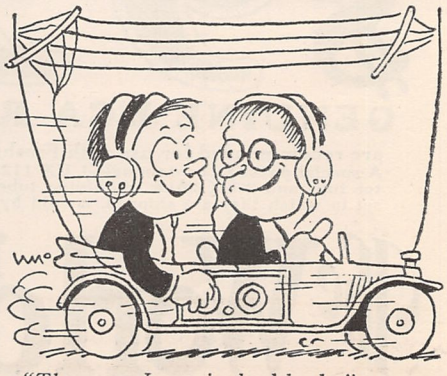
BUILD FROM THE BEGINNING

If the amateur tries this plan of beginning with a small tube and adding larger tubes when he can afford them, he should build and wire the transmitter for the large tubes in the beginning; so that he will not have to rebuild when they are acquired. The inductances, condensers, wiring, and meters should all be designed for a 100-watt set, so that no parts will have to be replaced later. The meters will be rather large to use with a 5-watt tube, but they will do all right. The use of large wire or tubing in the inductances and wiring is unnecessary for the 5-watt tube, though it will add greatly to the efficiency of the set when this tube is used.

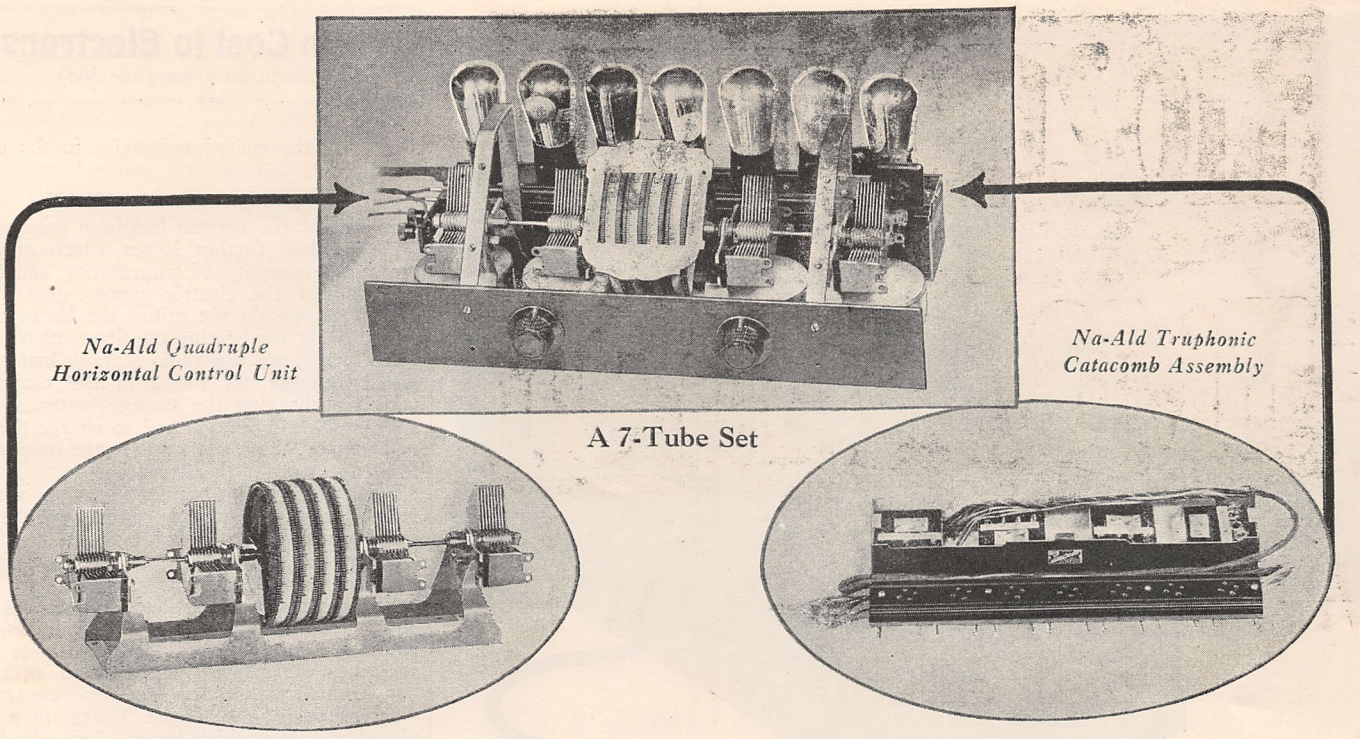
The same arrangement of tube sockets as in Fig. 1 is shown with the filament circuit completed in Fig. 3; this is a loose-coupled, shunt-feed Hartley circuit, which is about the best to use for amateur C.W. transmission.

All the data on the sizes of condensers, coils, and meters for the construction of a 40-meter C.W. transmitter are shown in the drawing. The sizes given need not be followed exactly, of course, but are offered merely as suggestions. Even the circuit is optional; this arrangement of sockets can be used with any regular C.W. circuit. It can be changed, if desired, and a 50-watt tube socket put in the center with a 5-watt socket on each side of it. This will allow the use of 5, 10, or 50 watts at the will of the operator. The cost of the tubes will be much less with this arrangement than with the other, or two 50-watt and one 5-watt tubes.

THE PINCH OF POVERTY



"They say Jones is dead-broke."
"He is. He couldn't pay for the upkeep of a crystal set."



A 7-Tube Set

Two Na-Ald Products

Bring Ease and Rapidity to Set Building

Complete Sets—Professional in appearance and certain in results

THE Na-Ald Truphonic Catacomb assembly plus the Na-Ald Localized Control Unit permit the quick easy construction of radio sets which are professional in their appearance and certain in their results. For the seven-tube set illustrated, other parts needed are only a grid leak and condenser, any type of radio frequency coils, rheostats and a few minor fittings.

Truphonic Amplification gives to these sets a quality of reproduction beautifully clear, exquisitely precise and at an exceptonal volume. It is a new invention based on a new principal of amplification.

The Na-Ald Truphonic Catacomb Assembly consists of a lacquered steel box 2" high, 2½" wide and for six tubes 12½" long, and for seven tubes 14¾" long. Three Truphonic Couplers, a Gang Mount Socket, an output unit for protecting loud speaker when power tube is used in last stage and cables for attaching batteries. Gang Mount Socket fits on top of box. The contacts are firm, positive and universal. The socket panel has unique wiring. There is one piece of metal for all common filament and continuous metal from plate and grid terminals to connected apparatus. This clever arrangement allows any hook-up to be used and any set layout to be employed. At the same time, short leads can go direct to the R.F. circuit, and no connections need be exposed except those to coils and condensers. Thus wiring is reduced to a minimum. The number of soldered joints vastly decreased. Time and labor cut by half. And, the result trim and smart in appearance. The entire audio frequency circuit is shielded in this small box.

The Na-Ald Localized Control Unit has all the advantages of single control without sacrificing any of the benefits and efficiency of multiple control. The condensers on a common axis are rigidly mounted on a chasis parallel to the panel. Each condenser is a separate unit which is wired as in multiple control. The tuning drums are grouped together and controlled through one opening in the panel. All can be moved together by three fingers of one hand, or each can be moved separately. No contact with panel makes possible the use of any panel material.

The user of this remarkably simple tuning device is able to go from station to station as easily as turning the pages of a book.

Truphonic Catacomb Assembly

No. 306 with six sockets	$20.
No. 307 with seven sockets	22.
Truphonic Couplers, Individual	$5.00 per stage
Truphonic Output Unit No. 301	5.00 " "

Na-Ald Localized Control Unit

Double No. 2172	$8.00
Double No. 2170	10.00
With Tickler Controls	
Triple No. 2173	10.00
Quadruple No. 2174	15.00

For further information write—

Alden Manufacturing Company

Alden Processed
NA-ALD
Sockets and Dials

Dept. K22, Springfield, Mass.

NOBATTRY
"B" POWER UNIT

Backed by the Bosch reputation for precision built electrical equipment, the Bosch NoBattry comes to you as a thoroughly satisfactory power unit for supplying "B" current to your radio—a final answer to an insistent demand. The NoBattry appeals to both the skilled and the unskilled in radio because it is personally safe to use—mistake proof, cannot burn out tubes. Powerful enough for any set up to 10 tubes and with the broadest range of capacity—90 to 135 volts or better of "B" current. Bosch NoBattry is entirely automatic, and gives unvarying power to keep the set at top efficiency. No AC hum, no chemical action noises, no filaments to burn, no acid to renew, no adding water. The new Edition 3 Bosch NoBattry not only puts an end to all "B" current supply troubles, it also improves the volume and tonal quality of all reception. It allows you to use your set to its full capacity for seeking out those distant stations. The Bosch Radio Dealer near you will gladly demonstrate the NoBattry for you—we will be pleased to send you his address if you write us.

Ed. 3 for Alternating Current $55. **For Direct Current $42**

All prices slightly higher, Colorado and west and in Canada

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DEALERS & SET BUILDERS

It will pay you to investigate and build sets with our amazing new transformers. Highest efficiency, perfectly tuned and matched to exact peak. Designed for high power receivers. Also manufacturers of T.R.F. receivers and highest quality tubes and accessories.

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Exclusive distributors of H.F.L. Transformers.

For "UV" or UX Type Tubes

NEW KLOSNER UNIVERSAL SOCKET

Hexagonal shaped holes for large prongs, spring grip terminal lugs, and ease in mounting make it the socket leader for 1926.

KLOSNER RADIO CORPORATION

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Experimenter Publishing Co., 53 Park Place, N. Y. C.

From Coal to Electrons

(*Continued from page* 468)

18.8% of the energy originally in the coal available.

CHARGING THE BATTERY

Now that the current has been generated, we encounter further losses which originate in the necessity of transmitting and distributing of the electric energy generated. Ordinarily we do not utilize the house current directly for heating the filaments of our radio tubes; we use radio storage batteries. And we encounter losses in the chargers used for charging the storage batteries. If a 110-volt D.C. line is used to charge the 6-volt battery, the efficiency is in the neighborhood of 10%. With alternating current, the efficiency is somewhat higher. It varies from 20 to 60 per cent. in commercial chargers. Assuming an average value of 35%, we have left only 6.58% of the original energy.

Since, we can never hope to get out of our storage batteries as much energy as we put into them, this represents a further energy loss which we must contend with in our transformation of coal to electrons. Conservatively the above losses may be placed at 25%; which losses when added to the losses encountered in the preceding operations will leave less than 5% of the energy inherent in the original source of our energy, namely, coal.

In supplying the filaments of our tubes with current, in order to produce a heating effect and obtain electronic emission, we place controlling resistances or rheostats in series with one or the other of our storage battery leads. Usually, these regulating resistances are placed in parallel with each other, but in series with the tube filaments that are to be controlled.

IN THE FILAMENT CIRCUIT

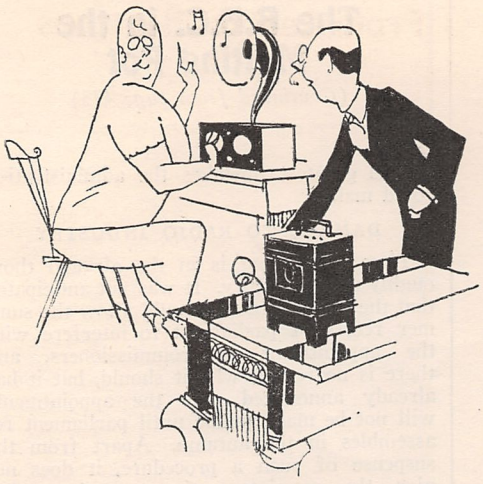
The combined filament circuit of any radio receiving set is made up of useful resistances (such as the resistances of the tube filaments) and resistances in which energy expended is actually energy lost.

The total energy supplied to the filament circuit of a set equals (in watts) the battery voltage multiplied by the amperage flowing out of the storage battery. A part of this supplied energy is lost in the controlling resistances, the amount being dependent upon the filament-circuit arrangement, as well as upon the settings of the variable filament-control resistances. In addition to this there are losses which may be attributed to useless heat radiation and light emission that can not be avoided, whenever resistances are being heated.

The energy loss in the filament circuit of the average five-tube set is very nearly 35%. Considering this loss we can easily see that only about 3.18% of the coal energy used in the electric generating plant is actually used for heating the filaments of our radio tubes. It can thus be seen that more than 96% of the energy of the coal is lost in the various processes of transformation of the potential coal energy into the heat liberating free electrons, without which modern radio is not possible.

PASSING THE CHAPEAU

French gendarmes are collecting subscriptions from local radio fans for the support of *Radio-Toulouse,* according to the *Wireless World.* The only station over here which might have been justified in following this system, would have been old "KOP," of the Detroit Police force, but the Detroit citizens would probably all have "kicked in" if the coppers called collecting coppers.



No tears in these tunes!

Unless, perchance, they're tears of joy. For there's only unalloyed pleasure in a set kept at its lively best with a Rectigon. Your batteries are charged with ease and convenience. But more than solid comfort—there's no costly grief. You'll shed no agonizing tears because of spoiled furnishings, ruined clothes. You can do your charging wherever you wish. There's nothing in a Rectigon to spill or burn. No acids, no chemicals—and no moving parts.

when you do your own charging with

The Westinghouse Rectigon Battery Charger

©, 1926, W. E. & M. Co.

No noise as it charges—not a bit of fuss. Not even a murmur that would disturb the mildest slumber.

Saves its cost in short order—Count the dollars spent in a few trips to the service station and you'll hotfoot it for a Rectigon, for the good it does your pocketbook as well as your batteries.

Snaps on in an instant—Just plug into the light socket, snap on the terminals. Saves service station bother. Spares interruptions caused by absent batteries.

Charges both "A" and "B" batteries—Keeps both packed with power. Bulb is used for "B" battery charging and it is enclosed, like all other parts, in metal, safe from accident. (Rectigon charges automobile batteries, too.)

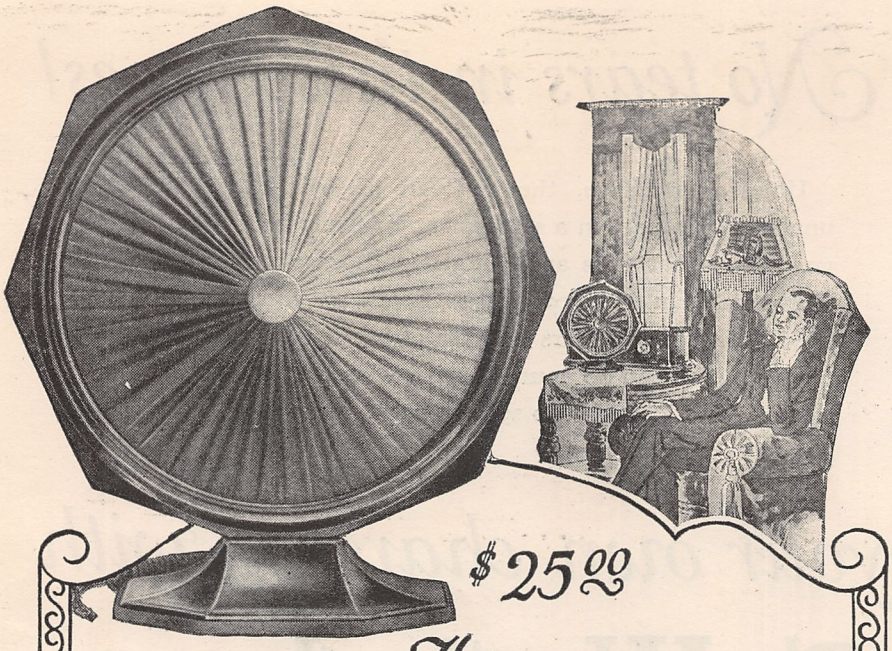
Perfect safety for your set—If you tune in while you're charging there'll be no harm either to set or batteries. Nor will batteries be discharged if anything happens to the current while your Rectigon's attached.

THE RECTIGON'S a superb Westinghouse product. Things you *can't* see, like extra heavy insulation, things you *can* see, like the durably enameled case—all are of highest quality. Westinghouse also manufactures a complete line of radio instruments, and Micarta panels and tubes.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.

Tune in on KDKA - KYW - WBZ - KFKX

No Storage Battery Radio is Complete Without a Rectigon



$25.00

The SONOCHORDE CONE

There are, of course, cheaper loudspeakers than Sonochorde. But they do not utilize the super-powered, patented amplifying unit only found in this matchless Cone. Besides the exclusive unit with its greater tone range and volume, Sonochorde is beautiful beyond comparison, furnished in three models. Octagonal in outline, with rich wine-colored cone of silk and handsome frame finished in semi-gloss mahogany, Sonochorde is indeed "the Speaker of Eloquence." See and hear it at your Dealer's.

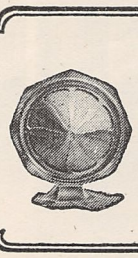
Write for the complete Sonochorde Story

Boudette Mfg. Co., Chelsea, Mass.

Designers and Manufacturers of the Sonochorde Cone

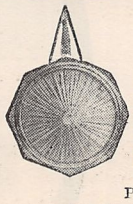
Factory Representative

Hastings Electric Sales Co.
42 Binford Street
Boston, Mass.



Note how back of each Sonochorde is protected against possible damage.

Floor Standard Model
Full 5 feet in height, mahogany frame and stand with all Sonochorde features.
Price $35



Wall Model
This beautiful design may be hung on the wall like a picture.
Price $27

All Specified Parts
FOR THE
World's Record Super 9 and 10

Send for free catalog of all the parts needed for these marvelous receivers that have made four world's records. We have in stock complete sets of the exact parts used by the designer in his original receiver. Verification of records sent upon request. Write today!

THOR RADIO MFG. CO.,
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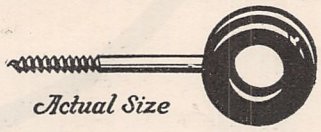
Rubber Covered Insulators



Actual Size

Neat and efficient. For antenna, ground and for lead in wires. Small screw starts readily and makes finished job. Great improvement over ordinary large, unsightly insulators. They keep the wires in place and out of the way. Packed 10 in a box, 25c at your dealers or direct from us.

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The B.B.C. in the Melting Pot

(*Continued from page 475*)

of the greatest mistakes the administration could make.

DAMAGE TO RADIO INDUSTRY

Thus, everything is in the air and thoroughly unsatisfactory. It was not anticipated that the administration would allow the summer recess of parliament to interfere with the appointment of commissioners, and there is no reason why it should, but it has already announced that the appointments will not be made public until parliament reassembles in the autumn. Apart from the suspense of such a procedure, it does not give the appointees time to thoroughly familiarize themselves with their new duties before taking over control on Dec. 31.

The suspense has caused the radio industry to re-open its campaign of protest against the fact that it is not receiving any representation on the commission of control of the new B. B. C. The broadcast listeners, as represented by the Wireless League, are doing the same. Both have interests at stake, and the present unsettled state of affairs and the obscure future of broadcasting is their justification.

The old B. B. C., as described above, announced its intention to replace the present stations by new high power stations. It has so far been unable to proceed with this plan owing to the withholding of funds by the government; and it is not yet known what the policy of the new Broadcasting Corporation will be, and whether the government will disgorge the accumulated funds, or whether the treasury will commandeer them for other purposes.

In September the radio season will commence with the annual radio exhibition in London, but how are the manufacturers to know, under these circumstances, what type of set to exhibit and put into mass production? And how is the listener to know what type of set to buy?

There is at present one British broadcasting station, Daventry, which operates outside the normal broadcast waveband, on 1,600 meters, and all receivers now have to be designed with interchangeable coils to take in this station. Nobody can tell whether the new broadcasting authority will introduce a new policy which will do away with the 1,600 meter wavelength, or perhaps establish more stations on other long wavelengths, or perhaps even introduce ultra-short wave broadcasting.

Broadcasting is so new a science that it is still far from becoming stable or saturated. Much progress remains to be made, and the old B. B. C. was steadily and logically making it. Now this orderly progress in England has been interrupted and the whole broadcasting service put into the melting pot. Whether it will emerge re-invigorated, ready to make further rapid strides in development, or whether it will crawl forth only to die an early and ignominious death, still remains to be seen. In the face of governmental interference of the nature outlined, the future prospects of British broadcasting are none too bright.

FOR THE BLASE

Sophisticated fans who are bored may be able to get a kick out of broadcasting yet, if they go to the trouble of tuning in the Atlantic Automobile Company's station at Anita, Iowa, on 273 meters. This station, until recently known as KFLZ, has changed its call letters to KICK.

The AMRAD Battery Type

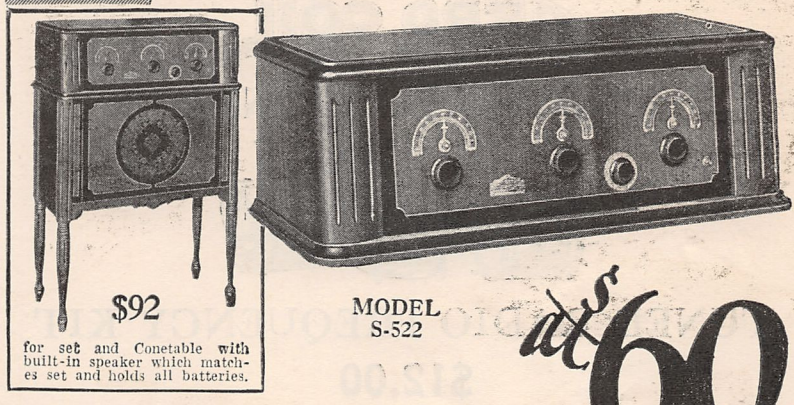
5 TUBE

NEUTRODYNE

Powel Crosley Jr. has so definitely applied his successful methods of mass production to Amrad developments that thousands of radio buyers will be able this season to purchase the superlative Amrad Neutrodynes at prices most unexpectedly low.

From an engineering point of view Amrad has few equals, in experience, equipment and in skill.

This beautifully two tone finished Battery Type set performs uncannily. Selectivity, tone and volume are all that can be desired. Crosley production has eliminated unessentials. Vital parts are the finest. It has already proven a great success.



$92

for set and Conetable with built-in speaker which matches set and holds all batteries.

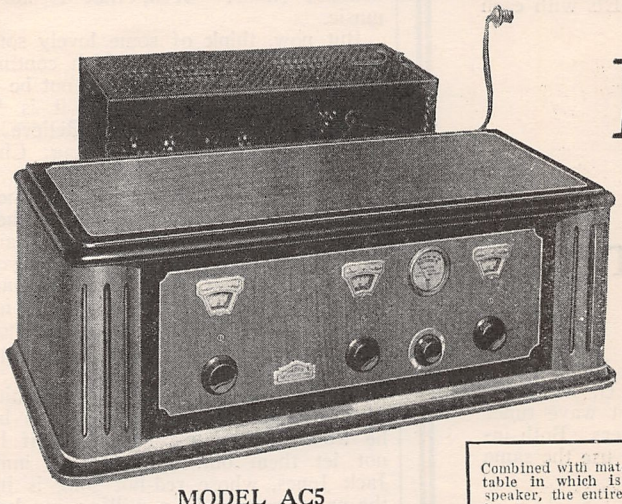
MODEL S-522

at $60.

LAMP SOCKET

The AMRAD AC with ELECTRIC POWER UNIT

NEUTRODYNE



MODEL AC5

at $150.

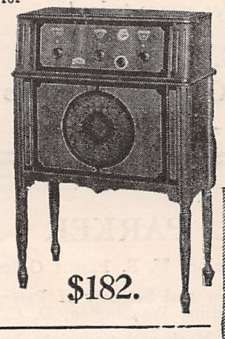
This is one of radio's GREAT achievements. All power for this set is taken from an electric lamp socket. Do not confuse with battery eliminators. Exclusive patented developments enable Amrad to present a batteryless radio at prices at least one hundred dollars or more under the prices of other sets in which the replacement of batteries has been eliminated. This set operates from a special power unit which gives unprecedented tone reproduction.

The Amrad Power Unit operates only as the set is being used. Voltages are always correct values. Exclusive Mershon condensers of 90 mfd capacity produce smooth, clear, lucid tones.

The set uses four UX-199 tubes and one UX-112 power tube. Operates on 60-cycle 100-120 volt a.c. current. Power unit uses two UX 216-B Rectron rectifier tubes to supply plate current at maximum B voltage of 135 as well as filament current for tubes.

Many critics find a new enthusiasm for radio as a result of the powerful, constant, neverfailing energy this apparatus supplies. The set delivers the utmost in radio enjoyment at an almost unbelievable price.

Combined with matching Conetable in which is built loud speaker, the entire outfit sells for



$182.

Dealers Wanted: Full details of Amrad proposition upon application to us or direct to your jobber. Please mention RADIO NEWS when writing.

AMRAD

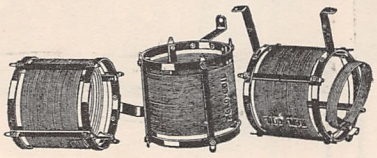
NEUTRODYNES

AMRAD CORPORATION, Medford Hillside, Mass.

GREATER DISTANCE
FINER SELECTIVITY
GREATER POWER

with

AERO COIL
SUPER-SENSITIVE
INDUCTANCE UNITS

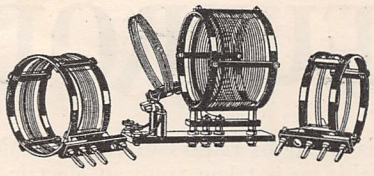


TUNED RADIO FREQUENCY KIT

$12.00

The Aero Coil Tuned Radio Frequency Kit illustrated above will positively improve the performance of any receiver. Patented Aero Coil construction eliminates radio frequency losses and brings tremendous improvement in volume, tone and selectivity.

Kit consists of three matched units. The antenna coupler has variable primary. Uses .00035 condenser. 8-page color circuit, layout and instruction sheet for building the supersensitive 5-tube Aero-Dyne receiver packed FREE with each kit. Extra copies, 75c each.



LOW WAVE TUNER KIT

$12.50

Completely interchangeable. Adopted by experts and amateurs. Range 15 to 130 meters. Includes three coils and base mounting, covering U. S. bands, 20, 40 and 80 meters. You can increase the range of this short wave tuner by securing coils No. 4 and 5. Combined range of 25 to 150 meters. Both interchangeable coils fit same base supplied with short wave kit and use the same condensers. Coil No. 4 price $4.00; Coil No. 5 price $4.00.

These Aero Coils are available at your dealers. Get yours today!

AERO PRODUCTS, INC.,
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BOLDTONE Speaker $18.00

—Patented tonal chamber gives violin mellowness; high, low notes. New principle. Beautiful walnut cabinet

—Order it; test it 3 days in comparison with others. If you don't like it better, send it back and money will be refunded. Write us.

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TRADE MARK

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Experimenter Publishing Co., 53 Park Place, N. Y. C.

The Meaning of Music

(*Continued from page* 492)

to describe, hard to make you feel. It is something you must experience for yourself, and once you have caught it, you will never misunderstand again. Those of my readers who have been thrown ino an ecstasy by a phrase of music, by the lilt of a melody, or the deep emotional intent of a chord, know what I mean. Perhaps it will help others, if I tell you this:

Great music is not recognized as such by a trick or a freak of fate. We do not put our hand into a grab bag and say "Number one is great, number two is not—now let us see, number one is Beethoven's Moonlight Sonata; number two is Hot Mama." Oh no! We term a thing of music *great*, only after it has been tried by time and found not wanting.

I will give an absolute test by which each of you can judge for yourself the greatness of a book, a musical composition or any artistic production. *How long can you hear it?*

THE TEST OF TIME

Think back a moment now. What song was it you were singing a while back—some popular music, ballad, ragtime blues, or something else? Where is it now? Do you feel you couldn't bear to hear it again? You know the sort of music—which, when you heard it first on the radio, you thought it was the cat's!—which after a while, you couldn't stand! Well, that is *not* great music.

But now, think of some lovely song you have known for years, which continues to thrill and move you. It need not be one of opera, or concert. Perhaps it is "Annie Laurie," or "Ben Bolt," or "Believe Me If All Those Endearing Young Charms." That's great music.

The secret of it all is plain. The more the composer *felt* when he wrote, the more you *feel*. If he was deeply stirred and had the genius to express that emotion, you will feel it too. You can't expect a man who writes a song to sell it, and who is most concerned about his royalties and how the public will "take it," to be very happy or sad in his mood of creation.

Franz Schubert never made anything out of his songs. But he wrote them because he would have burst with them if he had not let them out. Schubert is immortal. Jack Jones, whose red-hot song is just off the press, may make a million, but he'll not be remembered long.

THE LANGUAGE OF MUSIC

A moment ago, I said that you feel what the composer felt. Yes! The more as you are able to listen with imagination wide open. Perhaps you don't know how to do that. Perhaps, like so many others, you are in the habit of fighting relaxation and imagination. An infant, who has no "repressions," will cry or laugh according to the mood of good music. Little children will tell you the story they "see in imagination," while they hear it.

Every good piece of music is telling a story; I won't take the time and space here to go into the how and why. Another month I shall. But in the meantime I've prepared a book for the New York Edison Hour, which WRNY broadcasts each Tuesday night. It is called the "Arabian Nights' Radio Entertainment," but I really might have termed it "Moods in Music." It gives twenty or more programs of Edison Hours, each of which is devoted to a mood or picture. It brings into actual expression that something which is hinted at above. It shows how to use your imagination in listening to music. After you've heard just half of the Edison series, you'll never again be

Standard on **THORDARSON** *the Finest*

Supreme in MUSICAL PERFORMANCE!

Amplifying transformers.
Impedance amplifiers.
B-eliminator transformers.
Power amplifiers.
Transmission equipment.

AFTER painstaking research, seeking the ultimate in musical performance these receiving set manufacturers have all chosen Thordarson amplifying transformers as the finest to be had.

Follow the lead of the leaders—

Build or replace with

THORDARSONS

AMPLIFYING *Super* TRANSFORMERS

RAYTHEON made a vital contribution to the development of better B-Power by producing the Raytheon Rectifier tube, Type B, based on the gaseous, non-filament principle, and therefore giving long life to the B-Power unit.

But Raytheon did not stop with the Type B tube. As a result of the continued research of the remarkable Raytheon Laboratory, Raytheon has recently announced a new Type BH tube, with a capacity of 85 milliamperes, more than enough to supply current for the filaments of type 199 receiving tubes, connected in series.

The article in Radio News on the Browning Drake Receiver with the Lynch Power Amplifier calls for this new Raytheon Rectifier, Type BH. You will find it of interest. Raytheon is the Heart of Reliable Radio Power.

RAYTHEON MANUFACTURING COMPANY
Cambridge, Mass.

RAYTHEON

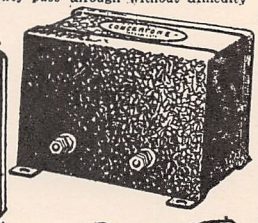
The Musical Notes—"Bass", "Medium-Low", "Middle" and "High"—fly forth on the ether waves to entertain people in homes far and near.

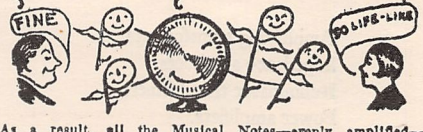
But alas! This home has a set equipped with common amplifying transformers which "fence out" both "Bass" and "High" Notes. Should they manage to "squeeze through" they'll be distorted or weakened.

Consequently, only "Medium Low" and "Middle" Notes pass through with ease, and the program doesn't sound as natural as it would were "Bass" and "High" Notes also present in full volume.

Coming, however, to the home using a pair of Jefferson "Concertones" in the set, the entrance is found wide open to ALL of the Musical Notes. They pass through without difficulty and are evenly amplified.

(Jefferson "Concertones" do not lose, distort or "blast" any notes from the lowest to the highest audible to human ears.)





As a result, all the Musical Notes—evenly amplified—come forth in proper unison as they left the broadcasting studio. You, too, will be very much delighted with the more natural tone and life-like reproduction of your programs.

SENSITIVITY is also increased and long distance reception is improved by these new large-size Jeffersons. Only $6 each at the stores. Install a pair and make your set a 1927 model in quality of tone!

Ideal for use with the new Power Tubes!

JEFFERSON Concertone

(AL-2 SEALED) AUDIO FREQUENCY TRANSFORMERS

FOR YOUR LYNCH POWER AMPLIFIER USE THESE JEFFERSON UNITS

Jefferson Power Amplifier and B-Supply Transformers and Chokes for the Lynch power amplifiers mentioned in this issue: No. 355 Transformer, $7; No. 356 Choke, $4; No. 358 Choke (Tone Filter), $5.

Without removing your tubes from the set—

KEEP TUBES LIKE NEW-CHARGE THEM MONTHLY *and* ALL AT ONCE

Tubes gradually weaken with use, as do batteries. Once a month attach Jefferson Tube Charger to light socket and connect with set for 10 minutes. Keep 201-A or UV-199 type tubes like new—at full efficiency. Rejuvenate run-down tubes. Improved reception with longer life of tubes and batteries will be worth many times the price to you. Guaranteed.

JEFFERSON TUBE CHARGER $3.50

Makes it easy to regularly charge tubes, all at once, in your set, at home. Enjoy top-notch reception every night. Get one from dealer today. Made only by Jefferson.

Send For Latest Literature

Jefferson Electric Mfg. Co.

Largest manufacturers of small transformers

541 SO. GREEN ST., CHICAGO, ILL. U.S.A.

The Browning-Drake with Lynch Power Amplifier

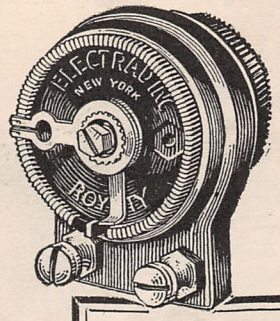
ELECTRAD

Used and Endorsed by Leading Radio Authorities

The New ELECTRAD

Royalty Variable High Resistances

Licensed by Technidyne Corporation under
U. S. Patent 1593685, July 27, 1926



ELECTRAD Royalty, the original wire-wound high resistance, is the choice of engineers and technicians who demand dependable and accurate resistance in ranges exactly adapted to their requirements. The new ELECTRAD Royalty High Resistances embody several important refinements. All ranges dissipate three watts. Note these exclusive features of superiority:

1—Resistance element is not exposed to any mechanical operation.
2—Electrical contact is made positive by metallic arm on wire-wound strip.
3—The same resistance is always obtained at the same point.
4—Resistance value is under control in process of manufacture and does not change in use.
5—Entire range of resistance is covered with less than a single turn of the knob.
6—There is no mechanical binding and shaft is turned smoothly over entire range.

Select the Range That Fits Your Needs

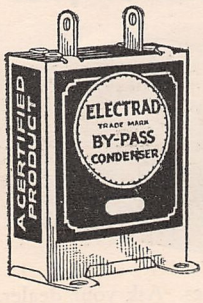
Type A—1/10 to 7 megohms.
Type B—1500 to 100,000 ohms.
Type C—500 to 50,000 ohms.
Type D—10,000 to 700,000 ohms (Detector control for B Eliminator).
Type E—Compensator — 500,000 ohm Potentiometer.
Type F—0 to 2,000 ohms.
Type G—0 to 10,000 ohms.
Type H—0 to 25,000 ohms.
Type J—0 to 200,000 ohms.
Type K—0 to 5000 ohms.
Type L—0 to 500,000 ohms.
Type E—$2.00—All other types $1.50.

ELECTRAD
Parts Specified in
The Lynch Socket Power Amplifier Hook-Up

1 ELECTRAD Royalty Variable High Resistance—Type C, 50,000 ohms.
1 ELECTRAD Royalty Variable High Resistance—Type H, 25,000 ohms.
1 ELECTRAD Royalty Variable High Resistance—Type L, 500,000 ohms.
6 ELECTRAD 1 mfd. Filter Condenser—Class 200, D.C. Working Voltage.
1 ELECTRAD 2 mfd. Filter Condenser—Class 200 D.C. Working Voltage.
2 ELECTRAD 4 mfd. Filter Condenser—Class 200 D.C. Working Voltage.
1 ELECTRAD 6 mfd. Filter Condenser—Class 200 D.C. Working Voltage.
2 ELECTRAD 1 mfd. Filter Condenser—Class 450 D.C. Working Voltage.

Hook-up circular sent free upon request.

ELECTRAD By-Pass and Filter Condensers



A WORKING VOLTAGE FOR EVERY NEED

Prevent B-voltage fluctuation and insure undistorted amplification. Each condenser tested and certified electrically and mechanically. Has low power factor, low radio-frequency resistance and negligible D.C. leakage. Prices, 50c to $3.75; in Canada, 85c to $5.25.

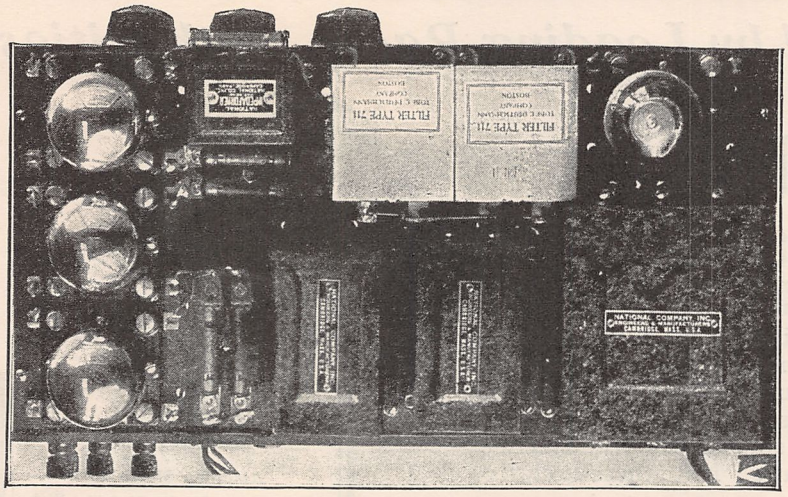
428-430 Broadway, New York

ELECTRAD Inc.

The Browning-Drake with Lynch Power Amplifier

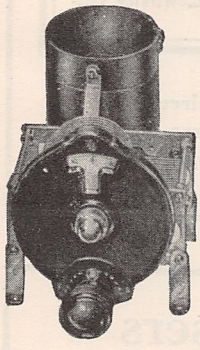
NATIONAL

Power Transformers, Duo-Chokes and Tone Filters



The new NATIONAL Power Transformer, Duo Chokes and Tone Filter are specified for use with the Raytheon Tube in a Lynch Power Amplifier, described in this issue of RADIO NEWS. The power transformer is designed especially for use with the Raytheon Tube. The Duo Chokes have a high inductance, although extremely compact, and in combination with the proper filter condensers may be depended upon to remove the last vestige of hum from the eliminator. The Tone Filter contains a plate-impedance and a 4 Mfd. TOBE Condenser and is necessary both to keep high D.C. voltage out of the loud-speaker and for true quality of reproduction. Each unit is enclosed in a grounded metal case.

Send for new Pamphlet N. R.

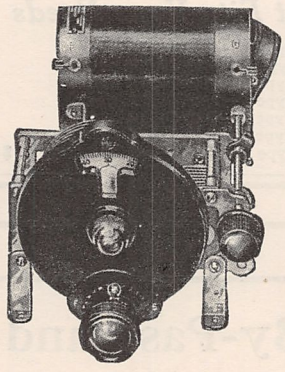


NATIONAL TUNING UNITS

Each NATIONAL Tuning Unit contains a Browning-Drake space-wound R.F. coil or transformer, a NATIONAL "Equicycle" (SLF) condenser and a NATIONAL Velvet-Vernier Dial. The new type C dial is *illuminated* by a tiny concealed light and is easily installed by anyone without special tools. One each of these units,—BD-1B and BD-2B are specified by Arthur H. Lynch for the Browning-Drake set described in RADIO NEWS for use in combination with the Lynch Power Amplifier.

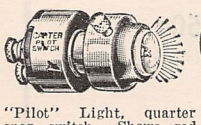
Prices—with illuminated Type C Dial

BD-1B.....$10.75
BD-2B.....$14.25



Send for pamphlet N.R. Be sure you get the genuine NATIONAL products.

NATIONAL COMPANY INC.
W. A. READY, Pres.
Engineers and Manufacturers
110 Brookline St., Cambridge, Mass.



CARTER

"Pilot" Light, quarter turn snap switch. Shows red light when set is operating. Complete with lamp $1.50.

Chosen for Browning-Drake

"Short" Jack, smallest made solder lugs widely spaced. Heavy Bakelite insulators. Open circuit 25c

More and more you'll find Carter parts specified in the better circuits. Engineers appreciate the originality of design and high quality of Carter Parts.

"HI-OHM" Volume Control 500,000 ohm. All metal construction. Moisture-proof resistance. Long life and unwavering electrical characteristics. Smooth action.

ANY DEALER CAN SUPPLY

Carter Radio Co.
300 S. RACINE AVENUE
CHICAGO, ILL., U.S.A.

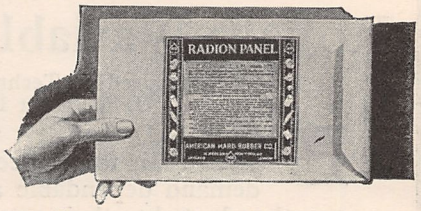
MEMBER RMA

Build the Browning-Drake

or any other set and reception will depend primarily on the integrity of the manufacturers who make the parts. That is why so many discriminating set-builders insist on genuine

RADION

The Supreme Insulation



You know that insulation is important, that tiny electrical impulses must be passed along through the circuit without possibility of leaks and losses.

RADION PANELS are made of a hard rubber compound especially developed for radio use. It is the most efficient panel insulation known. Electrical tests establish RADION as having the lowest angle phase difference, lowest dielectric constant, highest resistivity (megohms-cm), lowest power loss factor and lowest moisture absorption.

RADION PANELS are beautifully finished and produce an unmatched result in any cabinet. They are easy to cut, drill or engrave with simple home tools.

RADION PANELS★

are made in these stock sizes:

7 x 10	7 x 14	7 x 21	7 x 26
7 x 12	7 x 18	7 x 24	7 x 30

New Ace Quality Hard Rubber Panel with Crackle Surface★

At popular prices. Ask your dealer. Made in the same sizes as RADION PANELS. Will not show small scratches or finger prints. If your dealer does not have RADION or ACE PANELS write us stating size you want. Do not accept substitutes. Write to

AMERICAN HARD RUBBER COMPANY
11 Mercer St., New York, U.S.A.
Makers of RADION and ACE PANELS, DIALS, SOCKETS, BRACKETS
★ TUBES, COIL FORMS

The Browning-Drake with Lynch Power Amplifier

The Nation Pours Out its Endorsement of the Reigning Tube

CeCo

"The tubes work out very nicely indeed, the High Mu being one of the best that I have used in conjunction with resistance coupled amplifiers"
Glenn H. Browning.

USED IN AMATER-KENT SET
"As for your tubes, I figure this set has run me 3300 hours without being touched."
Robert Logan
Trenton, N. J.

Associated Radio Amateurs of Southern New England
"Attribute the success to efficiency and steadiness of your tubes."
Franklyn S. Huddy.

The Galloway Company
Waterloo, Iowa
"Have had very good results with CeCo Tubes."
C. R. Stout.

Wholesale Radio Co. of St. Louis, Missouri
"Uniformly good success with CeCo tubes."

National Hardware & Stove Co.
"The CeCo tubes equal to any on the market."
Robt. A. Harvey.

Brenard Man'f'g Company
Iowa City, Iowa
"Equal to the best, superior to most tubes offered today."
F. W. Kruchner

L. W. Cleveland Co.
Portland, Me.
"Feel more confident in recommending the CeCo Tube."
P. L. Farr.

Science Department,
The Arkansas State Normal School
"Excellent in every respect."
E. E. Cordrey.

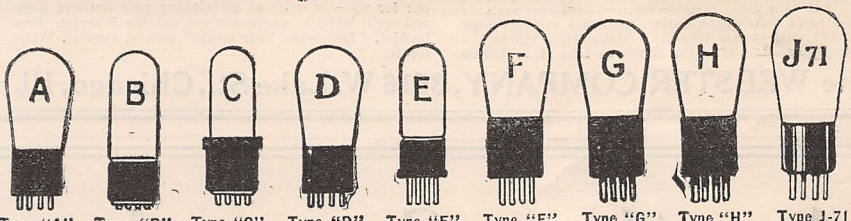
Tarr, McComb & Ware Commercial Co.
Kingman, Arizona
"An excellent radio tube gives entire satisfaction."
John Allen Ware.

Jefferson Electric Mfg. Co.
Chicago
"CeCo tubes, after exhaustion test simulating continuous use for one year's time, showed very nearly as good as new."
W. H. Hutter

Reading Foundry and Supply Co.
Reading, Pa.
"Can heartily recommend CeCo tubes in any set whatever."

From the Atlantic to the Pacific, from Lakes to Gulf, mountain states, prairie country, from every section of this great country come unsolicited letters from enthusiastic users of CeCo Tubes. Thousands could be printed if we had the space.

CeCo Tubes Make Any Good Receiver *BETTER*



Type "A" Storage Battery General Purpose $2.00

Type "B" Dry Cell General Purpose Small Base $2.00

Type "C" Dry Cell General Purpose Large Base $2.00

Type "D" Rectifier SPECIFICATIONS ONLY

Type "E" Dry Cell Power Amplifier $2.50

Type "F" Storage Battery Power Amplifier $5.00

Type "G" High-Mu for Resistance and Impedance Amplifiers $2.50

Type "H" Detector Non-Critical $2.50

Type J-71 Output Tube for High Power Amplifiers $6.00

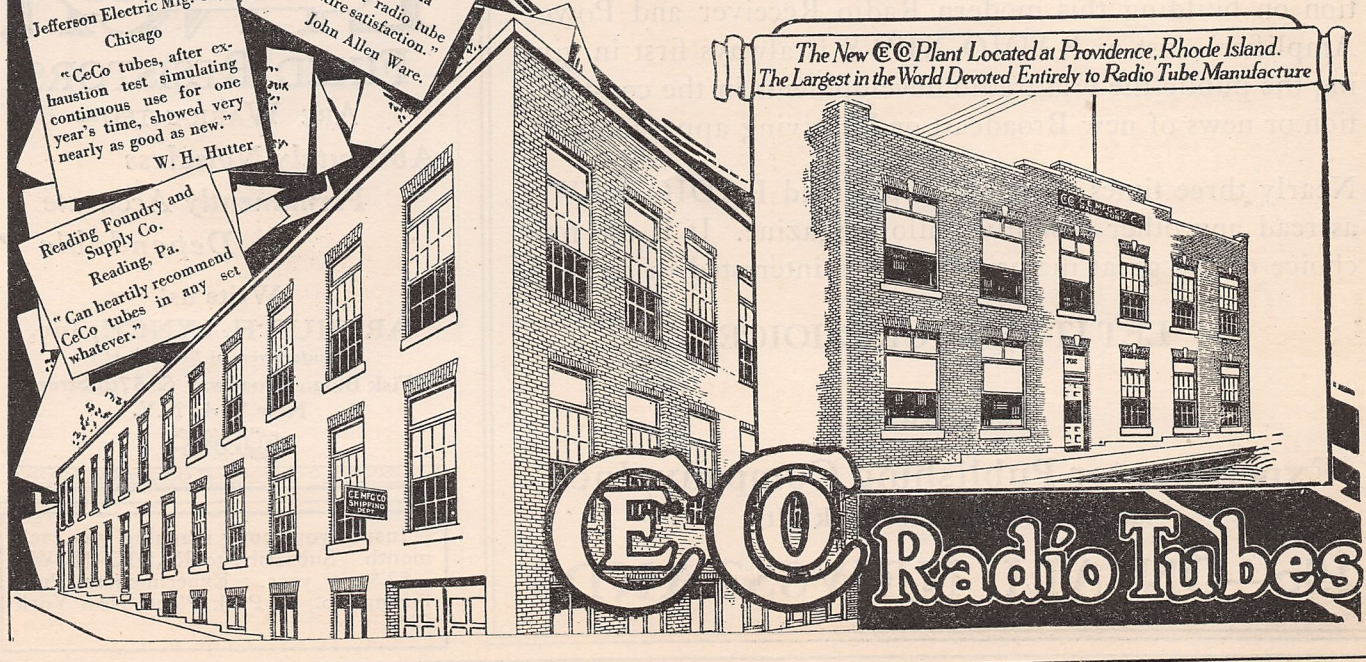
There's a CeCo Tube for Every Radio Need

Replace your old tubes with CeCo Tubes and note the difference in the performance of your set. There's no magic to this. The reason is simply that CeCo Tubes are conscientiously made and tested to the highest standards of electrical and mechanical perfection. They are really "best by test." Perhaps you can buy cheaper tubes. You cannot buy better ones at any price. Your dealer has CeCo Tubes or can get them for you.

Insist on the genuine stamped with the Name CeCo

C. E. MFG. CO., Inc., MEMBER RMA PROVIDENCE, R. I.

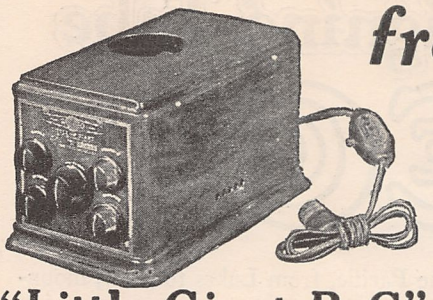
The New CeCo Plant Located at Providence, Rhode Island. The Largest in the World Devoted Entirely to Radio Tube Manufacture



CeCo Radio Tubes

The Browning-Drake with Lynch Power Amplifier

NOW! B and C Current from One Unit



Now you can get the most of your super power receiver. Here is a combined B and C current supply that will improve reception on any receiver. Ample power for the largest; fully adjustable to the needs of the smallest. Can be set to furnish the exact current needed to give the greatest distance, the most volume and the best tonal quality.

"Little Giant B-C" Power Supply Unit

5¾" high, 6⅛" wide, 11½" long overall.

The "Little Giant B-C" can deliver up to 85 milliamperes at 180 volts—current controllable for any set, detector B supply variable from 5 to 75 volts, intermediate "B" supply variable from 20 to 125 volts, power tube B variable from 125 to 180 volts. Intermediate "C" supply variable from 0 to 45 volts and power tube "C" variable from 0 to 45 volts.

The Webster "Duo-Choke" (pat. pdg.) filter equipment filters out all A.C. hum from the loud speaker.

The Webster line of power units also includes the Webster Super B, the same dimensions as the "Little Giant B-C" but with three variable voltages—detector variable from 5 to 75 volts—Intermediate amplifier variable from 20 to 125 volts—power tube tap variable from 125 to 150 volts. Price, complete with Raytheon tube B ...$39.00

"Popular B"—open model—3 voltages—detector variable from 5 to 75 volts—Intermediate amplifier variable from 20 to 125 volts—power tube tap delivers up to 135 volts. Price, complete with Raytheon tube B $35.00

All units operate on 100-125 volt, 50-60 cycle A.C. current, special model for D.C. supply. Prices slightly higher in Canada and west of Rockies.

Ask your dealer to show you a Webster unit. If he does not have one in stock it will pay you to have him get one for you—or write us mentioning your dealer's name and we'll tell you where you can get the Webster. Free booklet, "Improving Your Radio" sent on request. Write for it.

The WEBSTER COMPANY, 3516 W. Lake St., Chicago, Ill.

X-L VARIO-DENSER

Also Used by

ARTHUR LYNCH

in the

Improved

Browning-Drake Hookup

"I was really surprised at the fine adjustment I was able to get."

GLENN H. BROWNING.

also specified by

GERALD M. BEST

Endorsed by

POPULAR RADIO LABORATORY

Tested and Approved by

G. M. WILCOX

Prof. of Physics, Armour Institute of Technology.

SEE THAT SCREW

A Screw-Driver adjusts an X-L in crowded places

X-L VARIO DENSER

RESULTS in easier tuning, more distance, volume and clarity — greater stability. Indorsed by leading authorities.

MODEL "N"—A slight turn obtains correct tube oscillation on all tuned radio frequency circuits. Neutrodyne, Roberts two tube, Browning-Drake, McMurdo Silver's Knockout, etc. Capacity range 1.8 to 20 micro-micro farads. **PRICE** **$1.00**

MODEL "G"—with grid clips obtains the proper grid capacity on Cockaday circuits, filter and intermediate frequency tuning in heterodyne and positive grid bias in all sets.

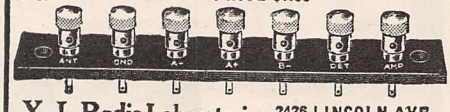
CAPACITY RANGE

Model G-1—.00002 to .0001 MFD
Model G-5—.0001 to .0005 MFD
Model G-10—.0003 to .001 MFD

PRICE $1.50

X-L PUSH POST—Push it down with your thumb, insert wire, remove pressure and wire is firmly held. Release instantly. **PRICE 15c**

PUSH POST PANEL—permanently marked in white on black insulating panel. In box including soldering lugs, raising bushings and screws for mounting, etc. **PRICE $1.50**



X-L Radio Laboratories, 2426 LINCOLN AVE., CHICAGO, ILL.

Another Scoop for "RADIO NEWS"

Radio's Greatest Magazine

Full construction details on the famous Browning-Drake two-tube receiver combined with the Lynch Power Amplifier are explained in full in this issue of RADIO NEWS.

RADIO NEWS is the first to offer the public full information on building this modern Radio Receiver and Power Amplifier—just as RADIO NEWS is always first in giving the public the vital radio developments in the construction or news of new Broadcast or Receiving apparatus.

Nearly three times as many people read RADIO NEWS as read any other monthly radio magazine. It is the first choice of the great majority of those interested in radio.

LET IT BE YOUR CHOICE

Published by

Experimenter Publishing Company, Inc.

53 Park Place, New York City

25c—ON ALL NEWSSTANDS

LYNCH METALLIZED FIXED RESISTORS

ARE WARRANTED—

Absolutely Noiseless

Permanently Accurate

Dependable

Write us!

ARTHUR H. LYNCH, Inc.

Manufacturers of Radio Devices

Fisk Bldg., Broadway & 57th Street

New York, N.Y.

MEMBER RMA

Insure your copy reaching you each month. Subscribe to RADIO NEWS —$2.50 a year. Experimenter Publishing Co., 53 Park Place, New York City.

The Browning-Drake with Lynch Power Amplifier

TOBE

TOBE Filter and Hi-Voltage Power Pack type condensers fill every need for filter construction in Raytheon and AmerTran Type "B" Eliminators and Power Amplifiers.

Recommended by Arthur H. Lynch, and universally endorsed and adopted by Radio editors and engineers.

The TOBE Hi-Voltage Power Pack type condensers have special and convenient safety terminals at the bottom of the can.

Ask your dealer for TOBE Condensers. And if you buy a "B" Eliminator, make sure it uses TOBE Condensers. Most of the good ones do.

TOBE DEUTSCHMANN CO.
Engineers and Manufacturers of Technical Apparatus
Cambridge, Mass.

Potter Condensers

Potter condensers, American made of highest quality materials to full capacity, build the best Socket Power Devices, Power Amplifiers, Impedance Amplifiers. And they are best for Filter Uses, Rectifiers, By Pass, and Blocking D.C. All types and sizes.

POTTER MANUFACTURING CO.
North Chicago, Illinois

When the neighbors and folks come in

to see that set you've made, you want it to do you credit in looks as well as in tone. You want it in a cabinet that takes away that "home-made" look — a cabinet that makes 'em say "What a peach of a set" — a cabinet the menfolks will appraise with a shrewd eye to its value, and their wives with envy of its lustrous, satiny surface and an inward resolve to make their husbands get one just like it. For the Baker Radio Cabinet, of genuine mahogany, just naturally fits into the picture in well furnished homes. And you'll be surprised at the low cost.

There is a Baker Cabinet to accommodate the new Browning-Drake 2 tube set

free

The
BAKER YACHT
BASIN, INC.
Quincy, Mass.

Please send me your free booklet describing Baker Cabinets in detail.

Name.....

Address.....

NOTICE

The October issue of RADIO NEWS contains an exclusive feature article on the Lynch Power Amplifier, giving full constructional details. Readers who desire this information and who cannot obtain the October issue in their locality can procure a copy by writing direct to us, enclosing 25 cents.

Experimenter Publishing Company, Inc.,
53 Park Place - - - - New York City

The Browning-Drake with Lynch Power Amplifier

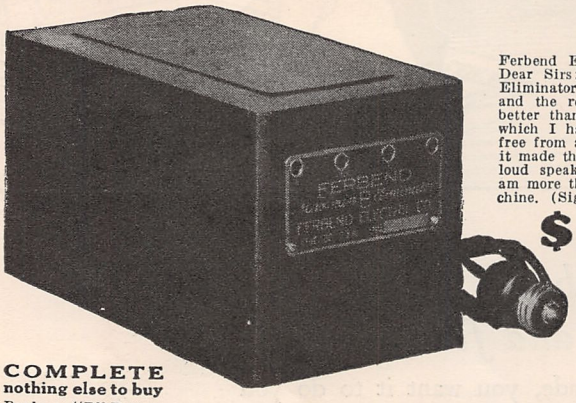
PROVED!

Los Angeles, Calif.
Ferbend Electric Co.
Dear Sirs: No doubt you will be interested to know that we have installed your "B" Eliminator on eight different eight tube Super-Heterodynes, and that every one is giving complete satisfaction. (Signed)
National Electric Company

Hawkesbury, Ont., Canada.
Ferbend Electric Co.
Gentlemen: I am pleased to inform you that I received the FERBEND "B" Eliminator and after giving it a fair trial am glad to say it has exceeded all my expectations. I must say it was money well spent.
(Signed) Will Dooley.

Naugatuck, Conn.
Ferbend Electric Co.
Dear Sirs: My FERBEND "B" Eliminator has been doing fine work since last December. After seven months use will say that I am very well pleased with it. (Signed)
Frank S. Lobdell.

Lincoln, Nebr.
Ferbend Electric Co.,
Dear Sirs: I have found your "B" Eliminator to be very satisfactory and the results obtained were even better than the more expensive —— which I had been using, as it was free from all hum. I also found that it made the reproduction through the loud speaker fully 50% clearer. I am more than satisfied with the machine. (Signed) H. W. Bradley



$12.50

COMPLETE
nothing else to buy
Replaces "B" Batteries. Operates Direct from Electric Light Socket.

APPROVED RADIO NEWS LABORATORIES 1922

FERBEND "B" ELIMINATOR

Many careful buyers choose to adopt a policy of "watchful waiting." This is often true in the purchase of an apparently better, but yet-to-be-proved, automobile. The same holds good for many other commodities. And Radio. With the original announcement of the good Ferbend "B" Eliminator and its amazing low price of $12.50, many there were who chose to wait. They wanted to be convinced. True, thousands bought at the start and *they are the ones who now tell you what to expect.* Lack of space alone prevents us from publishing the hundreds of fine testimonials from satisfied users. They are all in our files open to public inspecton at any time. A few reproduced here.

FERBEND Wave Trap

This Company also manufactures the famous Ferbend WAVE TRAP —the instrument which has been widely imitated but never equalled. It is the only original and genuine. Priced at **$8.50**

The Ferbend "B" Eliminator successfully passed the rigid Laboratory tests of Radio News, Popular Radio and Radio Broadcast. It is a *Proved* Radio necessity, and a great one.

Ask Your Dealer—or Send Direct

If you prefer, we will make shipment direct to you upon recept of price, or C. O. D., if desired. Use for 10 days to convince yourself—if unsatisfactory, write us within that time and purchase price will be refunded. Use the coupon now.

Ferbend Electric Co., 425 W. Superior St., Chicago, Ill.

MAIL THIS COUPON TO-DAY!

FERBEND ELECTRIC CO., 425 W. Superior St., Chicago

☐ Send at once. Payment enclosed ☐ Send C. O. D. ☐ Send Literature

Name .....

Address .....

City ..... State .....

FREE!— Radio Catalogue

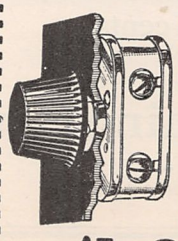
Radio Parts of the Best Quality

1. Right Prices
2. Quick Delivery
3. Dealer Cooperation
4. Complete Stock
5. National Advertising

CHICAGO RADIO APPARATUS
415 South Dearborn Street, Chicago
Dept. RN

Bradleystat

PERFECT FILAMENT CONTROL



Provides complete noiseless filament control for all radio tubes without change of connections. Metal parts are nickel plated. One hole mounting. Self contained switch opens battery circuit when desired.

Allen-Bradley Co.
Electric Controlling Apparatus
287 Greenfield Avenue Milwaukee, Wis.

afraid of any concert, because *you'll know how to listen.* (Yes, indeed, a copy of the Arabian Nights' Radio Book will be sent to you if you write to WRNY).

Now for a pause, and a glance back over the month at our station. It's always good for us, as well as you, to accumulate some of the big things and see how they look in a tabloid paragraph or so. They say that Caesar had his Ides of March, but that program directors have their August; which is to indicate that the worst time of the year is the month just passed for us. (As I write these words, September has just begun). Well, is this so bad?

SONGS OF FAR-AWAY LANDS

Lina Abarbanell! She who delighted the audiences in "Madame Sherry," "Merry Widow," and so many other successes of light and grand opera—she was a pretty little Hansel in "Hansel and Gretel." And there was John Quine, the American concert baritone. There came Ragani Devi, of the Hindu temples of Cashmere—came with the anklets, bracelets, necklaces, earrings and even the diamond in her nostril—came with the long-stringed, lazy-languorous-toned tambura and the brighter sitar—came with the atmosphere of the bazaars and the Orient. The night Ragani Devi sang and danced, Yugi Hirose of Japan intoned the melodies of Tokio and the cherry-blossomed interior of the island. But perhaps the biggest individual appearance of the month was that of Vincent Ballaster, the greatest singer of Spain, and probably in many respects the greatest living lyric baritone. Ballaster and Galli Curci, Ballaster and Mary Garden, Ballaster and Martinelli—these have headed the bills of the Metropolitan and Chicago Opera Companies. It would be lacking in taste not to mention in this same paragraph, John Barnes Wells, tenor and composer. For Wells, Ballaster, Huarte, Devi, Hirose, Quine and Abarbanell were soloists with the Edison Ensemble.

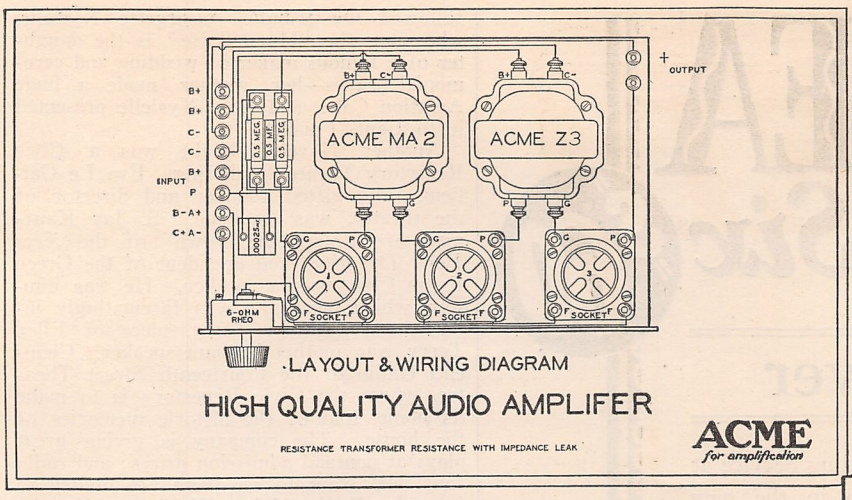
A new and beautiful ensemble of music has been added, with Theodore van Yorx at the helm. And speaking of beauty, we must record that Rita Montaner, one of the loveliest women of Cuba, was a unique broadcaster over WRNY, with Xavier Cugat as her accompanist.

By the way, did you hear Dr. Sigmund Spaeth? The distinguished critic has turned humorist in music. He is disinterring old songs which now sound so ridiculous; it's part of his book, "Words and Music." One chapter which Dr. Spaeth broadcast is "The Great American Opera," which, like goulash, has everything in it.

"The Scamps" came back. You saw their picture last month; they are the boys of the S.S. Majestic. And how they can play jazz! Harold Loomis' Orchestra is another fine dance number on WRNY's programs.

THOSE NOVELTY NIGHTS!

One was "A Night in Mexico," and none other than the members of the Mexican Consulate, if you please, were over to conduct it. Another great Novelty Night program, and one which is likely to go down in history, was the René Fonck tribute. That night at WRNY, in The Roosevelt studio, we toasted Fonck over the air. The President of the United States, the Governor of New York State, the Mayor of New York City, the Ambassador of France, all sent gracious messages. Hon. Nelson Ruttenberg spoke for the State of New York; Consul-General Maxime Mongendre for France; Col. Harold Hartney, of the Argonauts, Lieut. Allen P. Snody, who accompanies Fonck; Walter Wellman, who made the first attempt at trans-Atlantic flight; Viola Gentry, the aviatrice who flew under the Brooklyn Bridge, and many other distinguished guests were there. And Capt. Fonck described his route, as he plans to make the hop. (There was an informal touch which



The slogan "Acme for amplification" has become a promise that Acme can be depended upon for amplification without distortion. In the research laboratories here at Cambridge we have made countless experiments on audio amplification and the diagram above gives the latest results of these endeavors. This audio amplifier is of three stages, first resistance coupling, second transformer coupling, and last resistance coupling with impedance leak. On account of the high B-voltages now in common use one of the objections to resistance amplification has been overcome but with the impedance leak the last objection has been swept aside. Without this leak rectification occurs in the amplifiers making all speech and music fuzzy and indistinct.

Power tubes such as the UX-171 can be very successfully used in the last stage of this amplifier and orchestra volume be obtained without the desire to turn it down.

Add this amplifier to any set after the detector and radio broadcasting will bring you new thrills; all the notes, tones, and inflections can be reproduced. You will then realize that after all, "How well you can hear" is the only thing that really counts.

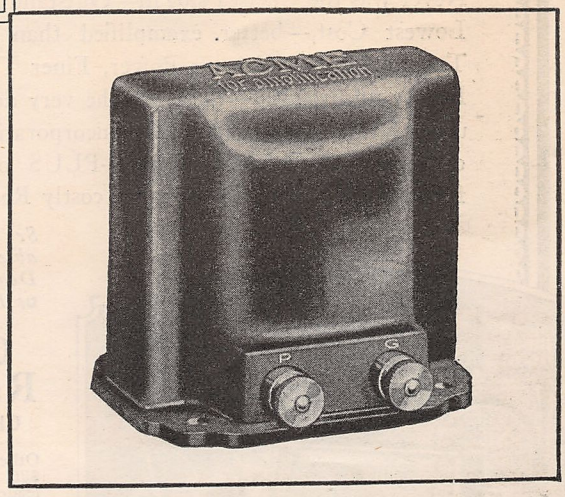
More amplification
—without distortion

With the Acme MA-2 transformer more amplification without distortion can be had than with any other transformer. This transformer is enclosed in a metal case and has a ratio of 5 to 1.

MA-2 A.F. Transformer $6.00
A-2 A.F. Transformer $3.00
Z-3 A.F. Resistance and Impedance $5.00

Many people are turning to Acme for amplification so that the extremely low and extremely high frequencies can also be amplified.

Z-2 Amplifying Impedance $4.50



Now! add "balloon tires and shock absorbers" to your own radio set

Yours is probably one of the 5,000,000 radio sets that's passed its first birthday—maybe its second or third.

Like your old car, it's worth more to you in pleasure and value, than the price some one else would pay to buy it. And, like the old car, you hate to give up such a loyal old friend.

It really isn't necessary—less necessary than in the case of your car. Balloon tires and *real* shock absorbers have made your car ride as comfortable as any in the land. We can show you how to make your old set as free from noise and distortion as a church at 4 A. M.

Our method is that of "more amplification without distortion" (shown above).

Write for your copy of the 13th edition of "Amplification without Distortion," a little book written by a prominent radio engineer in non-technical, easily followed style. 500,000 friends of Acme have found the first twelve editions valuable—the 13th contains the facts on the newest methods of securing strong, clear radio reception—of eliminating causes of distortion. It describes in particular the new Acme amplification method, and in addition includes details of the new Acme free edge cone speakers and A, B and C power supply units (which can make your set a lamp socket receiver—overnight).

ACME APPARATUS COMPANY
Dept. K19, Cambridge, Mass.
Gentlemen:—
I am enclosing 10 cents (U. S. stamps or coin) for a copy of your book "Amplification without Distortion."
Name .....
Street .....
City ..... *State*.....

ACME ~for amplification

CHELSEA Truphonic Six $60

Greater Power

Never was the Chelsea slogan—Outstanding Service at Lowest Cost,—better. exemplified than in the new Truphonic Six. Greater Power, Finer Tone Quality, Beauty unsurpassed—these are the very definite attributes of this amazing Receiver incorporating the radically new Truphonic circuit—PLUS other notable features only found in far more costly Receivers.

See This Incomparable Value at your Dealer's or Write us Direct.

Chelsea Radio Co.
Chelsea, Mass.

Other Chelsea Sets $26 and $50—each a leader in its class.

Write for details

100 Volt Storage "B" Battery $10

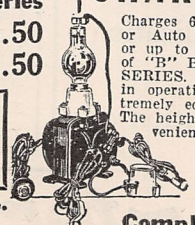
Everybody can now enjoy the benefits of Storage "B" Batteries—more power, quieter reception, greater economy. Rubber case prevents leakage or shorting. Easy to recharge. Will last for years with ordinary care.

SERVICE Rechargeable "B" Batteries
in all-rubber cases
100 VOLTS $10.00
50 VOLT $5.50
125 VOLT $12.50

Prices in Canada:
50 Volt . . $7.75
100 Volt . . $14.50
125 Volt . . $17.00

SERVICE "A" Batteries
Indestructible rubber case. 2 year guarantee.
6Volt. 100amp. hr. $14.00
6Volt. 120amp. hr. $16.00

SERVICE Double-Duty CHARGER
Charges 6-volt "A" or Auto Batteries or up to 125 volts of "B" Battery IN SERIES. Noiseless in operation. Extremely economical. The height of convenience.



Complete with Bulb $14.50

SERVICE BATTERY CO. *of Canada,* 137 Roncesvalles Ave. Toronto, Ontario

SERVICE BATTERY CO.
704 East 102nd Street Cleveland, Ohio

followed the tribute. Georgette Nyrielle, who sang the "Marseillaise," is the daughter of a famous maker of wedding and ceremonial cakes—her mother made a huge Aviation Cake, and Miss Nyrielle presented it to Capt. Fonck).

Another Novelty Night was a Civic Repertory Theatre gathering. Eva Le Gallienne, the gifted founder and director of the theatre, was on hand. S. Jay Kaufman of "Round the Town" of the *New York Telegram,* and president of the Green Room Club, was a speaker. He was himself, which means he was fascinatingly interesting. Beatrice Terry, niece of Ellen Terry, was another brilliant speaker. Clementi Giulio of the Fourteenth Street Theatre, where the Civic Repertory is to make its home, told of the historic memories of the house. The company is giving great plays at nominal admission prices; and radio fans who want to see them are invited to join the Radio Unit. Write to Miss Le Gallienne or to me at WRNY.

A BIT OF EVERYTHING

Another novelty was Birdie Reeve, the girl with the typewriter. As fast as an assembled group could mention names of prominent men—Roosevelt, Wilson, Lloyd George, Hughes, etc.—she quoted from memory a speech of theirs, and typewrote it at the same time. Then she wrote one address while speaking another; she played a game of chess, while doing everything else. And Birdie is only sixteen and uses only two fingers of each hand to typewrite—and she beats the world's champion.

Have you followed the Saturday morning symposiums? I'll tell you more of them next month. But just this much now: We had Deputy Attorney General Reba Swain, Col. Beard, Harry Mayer (who started the Halls-Mills case all over), Bert Berger, Creté Hutchinson, Jessie Tarbox Beals, Maurice Livingston, Hetty Cattell, Joan Lowell, Irene Kuhn and many others.

Each speaker talks for five minutes on his or her special work. Then I ask a crazy question like "What's going to happen in the Hall case?" or "What do you think of Pola Negri?" or "State your views of the Mexican Catholic situation"—and without preparation, each one gives a live comment. It's lots of fun. Intellectual impetus, as "Pioneer" of the *New York Herald-Tribune* calls it.

In closing, I give you another scoop. Congressman Fiorello La Guardia has spoken twice, and is scheduled for every other Wednesday night, to talk on live political questions.

Who said August is so dull?

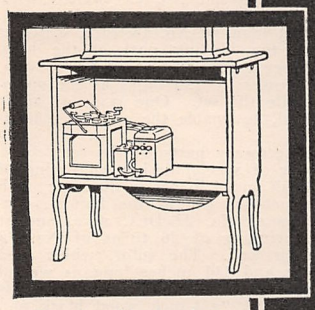
THE YOUNGER GENERATION

Mother (listening to daughter over radio): "Now I wonder who Mike is."

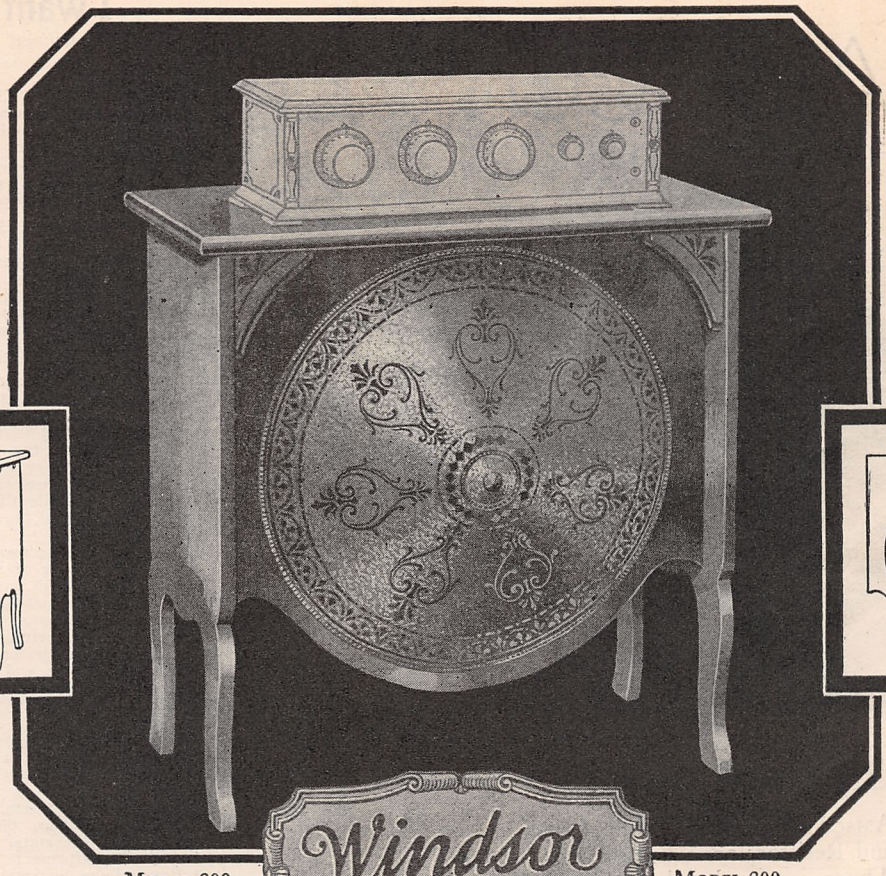
$29.00

Console with Cone Loudspeaker Ready for Your Set and Batteries

(West of the Rockies $35)

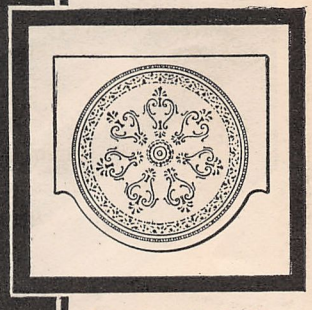


Rear view showing large compartment providing ample space for all batteries, battery charger or battery eliminator. These are entirely concealed from view. The back is open for ventilation of batteries.



MODEL 200 *with 22-inch Cone*

MODEL 200 *with 22-inch Cone*



The Cone Loudspeaker, with its Spruce sounding board, is quickly and easily removable, allowing instant access to all batteries, battery eliminator or other equipment and wiring.

A Revelation in *Radio Reproduction*

AT LAST—a cone loudspeaker that reproduces *all* the tones as they are broadcast. From the deep voiced tuba of an orchestra to the softest note of a vocal solo—*every* tone—*every* sound is reproduced in all its beauty, just as it entered the microphone.

* *

This 22-inch Windsor Cone Loudspeaker, with its *spruce* sounding board, will reproduce the sofest crooning lullaby in a softly lighted room, or the full throated march music of a band in an auditorium—both with perfect fidelity of sound and tone.

* *

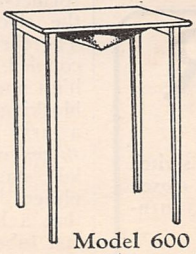
The Windsor Cone Loudspeaker Console is the greatest value in the world of radio. When compared with the average cost of cone-type loudspeakers of even smaller size, the cost of the complete Windsor—cone loudspeaker, spruce sounding board, and console—is amazingly low.

* *

As a piece of furniture, the Windsor Cone Loudspeaker Console is of such manifest high quality and attractive design as to be a welcome addition to any home. Finished in Mahogany or Walnut.

* *

The Windsor Cone and Horn Loudspeakers, combined with attractive pieces of furniture in many models, are being demonstrated by recognized dealers everywhere.



Model 600

With 16-inch Cone (*Pat. applied for*)

This 20 by 17-inch Cone Loudspeaker Table has suspended from the underside of the top a 16-inch Windsor Cone Loudspeaker. Placed in any part of a room, it fills the room with music just as an inverted electric lamp floods the room with light. Finished in Mahogany or Walnut. Price..... **$19**

(West of Rockies, $23.00)

Go to your dealer today and examine this astonishing new Cone Loudspeaker Console. If he happens not to have one, write to us and we will tell you the name of the nearest store at which you can see and hear one.

Note to Dealers Write or wire today for details of the highly profitable Windsor selling franchise

WINDSOR FURNITURE COMPANY

World's Largest Manufacturers and Originators of Loudspeaker Consoles

1410 Carroll Avenue Chicago, Illinois

Los Angeles Branch—917 Maple Avenue

WINDSOR FURNITURE COMPANY
Electrical Department
1410 Carroll Avenue, Chicago, Illinois

Send me FREE and without obligation circulars of the Windsor line of Cone and Horn Loudspeakers combined with pieces of furniture, and name of nearest dealer:

Name.....

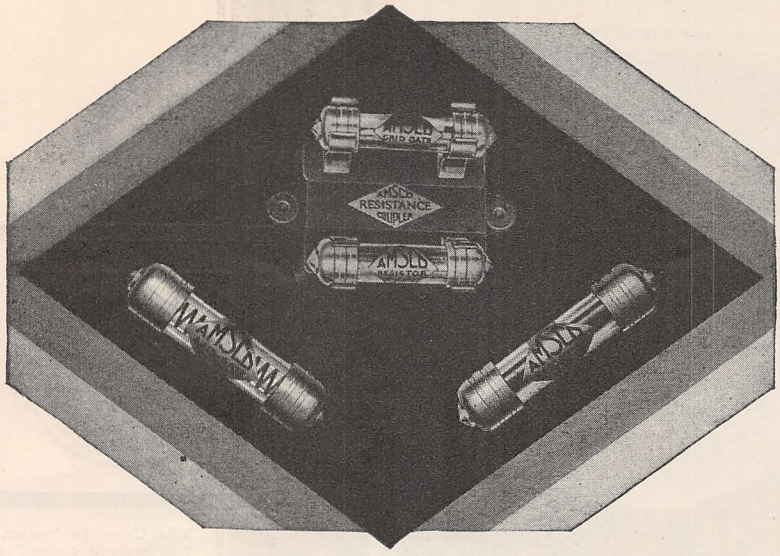
Address.....

City..... *State*.....

Dealer's Name.....

AMSCO

FOR EXCELLENCE



Silence, Please!

Amsco Metaloid Grid Gates and Resistors are uniquely silent. There is no thunder in them. They do their work noiselessly—and they give you—*TONE.*

The secret of Amsco excellence is in the new Metaloid resistance element—*colloidal and unbroken*, superseding crystalline forms, with their jagged, noisy pathway to the current flow.

It pays to insist upon getting Amsco Metaloid Grid Gates, Amsco Metaloid Resistors, Amsco Resistance Coupled Amplifier Units. *For Excellence!*

AMSCO PRODUCTS, Inc.
Broome & Lafayette Sts., N. Y. C.

AMSCO

MEMBER RMA

Half Size

CARTER

"HI-OHM" Volume Control and Filament Switch

Simplifies the operation of the set and eliminates the battery switch. As soon as the knob is turned from "off" position, the filament switch is closed and remains closed until the "HI-OHM" is turned off.

Any dealer can supply

IN CANADA—CARTER RADIO CO., LIMITED, TORONTO

$2.50 Complete with arrow pointer knob.

500,000 Ohm 100,000 Ohm
300,000 Ohm 50,000 Ohm
200,000 Ohm 10,000 Ohm
Resistances

Carter Radio Co.
300 S. RACINE AVENUE
CHICAGO, ILL., U.S.A.

MEMBER RMA

Insure your copy reaching you each month. Subscribe to Radio News—
$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

I Want to Know

(*Continued from page* 520)

One Resistor, type "EB" and two Resistors, type "DEB" (Ward-Leonard). (See table above for computing the number of these required for various sets.)

A WELL-DESIGNED SUPER-REGENERATOR

(Q. 2193) Mr. S. K. Walker, North Bergen, N. J., asks:

Q. 1. Will you please furnish me with the circuit diagram of an efficient and well-designed Super-Regenerative circuit, one that you think would give satisfactory results?

A. 1. The accompanying diagram of the wiring connections, with detailed data, of a super-regenerative receiver are self-explanatory.

The loop aerial used in conjunction with this set is wound with 7-strand No. 22 twisted wire. 12 turns separated ½-inch on a 42-inch square. An aerial, 150 feet long, of No. 14 wire, which is connected to the top binding post of the loop, effects reception over a radius of about 1,000 miles. This distance increases by 150 miles as the operator learns to handle the set. One stage of audio frequency is added, to enable the use of a loud-speaker.

These are the necessary parts of the set:

One variocoupler of special design, consisting of tubing 4 inches high and 4 inches in diameter, with a regenerator inductance coil at the bottom, consisting of 35 turns of No. 22 DCC wire, and at the top a stator winding of 26 turns of No. 30 DCC wire on each half. The rotor, which is 3 inches in diameter and 1½ inches long, is wound with 26 turns of No. 30 DCC wire. All this is mounted on a 4½"x4½"x⅞-inch wood block and shellacked.

One Air-choke Coil wound with 400 turns of No. 28 enameled wire on a 5-inch tube 8 inches long, supported by blocks cut to fit under each end and shellacked.

3 Variable Condensers, .001-μf.;
1 Fixed Condenser, .005-μf.;
3 Filament Rheostats, one with vernier;
1 A.F. Transformer;
3 Power-Tube Sockets;
3 UV-202 or UX-210 Tubes;
1 Bakelite Panel, 12x21x3/16 inches;
2 "C" Batteries, 0-12 volts;
1 "B" Battery, 100-200 volts;
4 3-inch Dials;
2 Contact Arms, 1½" radius;
30 Contact Points;
6 Terminals for loop and battery connections;
2 Honeycomb Coils, 1,500-turn.

A 10-Tube Receiver of Advanced Design

(*Continued from page* 508)

rangement, it would be next to impossible to employ so many radio-frequency amplifiers and yet have them operate at maximum efficiency. The design and the positioning of the coils, as well as the shielded condenser unit, also help materially in maintaining stability in the radio-frequency amplifiers.

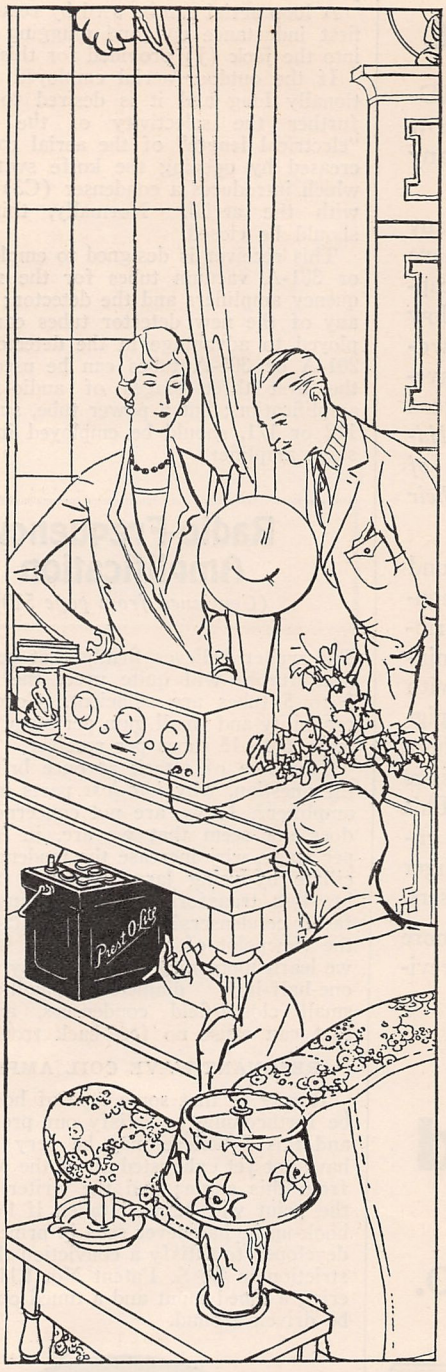
THE AUDIO AMPLIFIER

Engineering ability is evidenced in the design of the special four-stage audio-frequency amplifier. The first stage is transformer-coupled, the transformer (T) having the electrical characteristics of late types. The three succeeding stages are impedance-coupled. Each of these stages comprises one high impedance choke (T1), a high capacity blocking or isolating condenser (C5) and a grid resistance (R4). The first three stages employ the same "B" voltage. The last stage however, which is a power amplifier, has a separate "B" voltage tap, so that a higher potential can be used on the last tube, which may be a 112 or a 171.

OPTIONAL ADJUSTMENTS EASY

As already mentioned, plug-in coils are employed; so that the receiver can be equipped for receiving broadcasting on the very short waves, as well as the intermediate and high waves employed by most European stations. This is an advantage not to be had in most other receivers.

A special binding post (marked x in Figs. 2 and 3) is provided, so that the re-



It doesn't take a battery expert to buy the best battery

ANYONE who walks into a radio store and asks for a Prest-O-Lite Storage Battery is making as wise a purchase as any battery expert could make.

The name "Prest-O-Lite" stands for storage batteries made by a company that for more than twenty years has rigidly maintained the highest standards of manufacturing skill and honest workmanship.

Prest-O-Lite Radio "A" and "B" Batteries have been perfected especially for radio use, in the world's largest electro-chemical research laboratories.

They are not only made to give you long years of service, but they can be depended upon to deliver their rated ampere-hour capacities. These two qualities constitute the real measure of battery value, and hours of radio pleasure result.

Prest-O-Lite Radio Batteries are attractively priced from $4.75 up. It is unwise to take a chance on batteries of unknown make. Ask for Prest-O-Lite.

Send for free booklet

"What every owner of a radio should know about storage batteries" is a little booklet which every radio fan will find interesting and helpful. It is crammed full of hints that will bring surprising radio results—and save you money. It's yours for the asking, without obligation.

THE PREST-O-LITE CO., INC.
INDIANAPOLIS, IND.
New York San Francisco

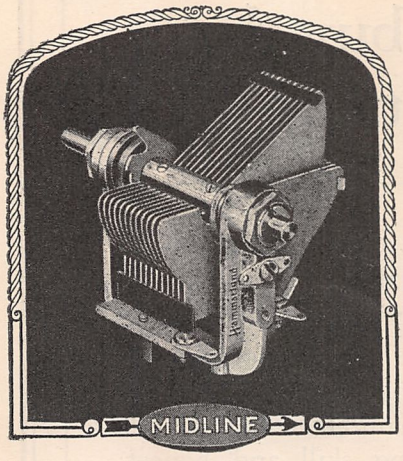
In Canada: Prest-O-Lite Company of Canada, Ltd., Toronto, Ontario

Designed especially for radio

Prest-O-Lite

STORAGE BATTERIES FOR MOTOR-CARS AND RADIO

Hammarlund's New Creation
The "MIDLINE" Condenser



THE new Hammarlund "MIDLINE" condenser makes its bow with the claim of superiority over any other type ever produced.

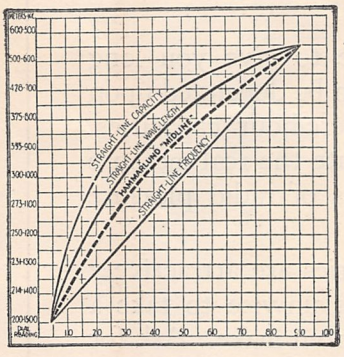
Experience is responsible for its many excellent features. Both you and we have learned that the old "Straight-line-capacity" type condenser crowded the low waves; "Straight-line-frequency" crowded the high waves; "Straight-line-wavelength" merely compromised between the two. *But the Hammarlund "Midline" retains the desirable qualities of these earlier types without any of their disadvantages.*

All of the time-tested Hammarlund features are included: soldered, non-corrosive, brass plates with tie bars; rib-reinforced aluminum alloy frame; minimum dielectric; one-hole mounting with anchoring screw; bronze clockspring pigtail; friction brake. In addition, there have been added ball and cone bearings and a full-floating rotor shaft. This shaft supports no weight; it may be entirely removed and replaced by a longer shaft for coupling to other condensers.

The "MIDLINE" is smaller, more compact and even stronger than previous Hammarlund models.

For sale by the better dealers.

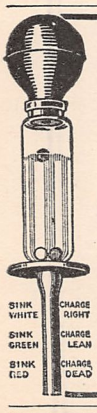
Avoids Crowding at Any Part of the Scale



The "Midline" Condenser is made in six standard capacities, including short-wave, single, dual and triple models.

For Better Radio
Hammarlund
PRECISION
PRODUCTS

HAMMARLUND MANUFACTURING CO.
424-438 W. 33d STREET, NEW YORK



SOS HYDROMETER

Simple—durable—accurate—
no float to break—balls
easy to read.

Swim all three, charged fully
Sinks the *white*, charge still *right*
Sinks the *green*, charge is *lean*
Sinks the *red*, charge is *dead*.

Over four million patented Chaslyn Balls used by leading Battery Manufacturers as standard equipment in Glass Cased Batteries and Power Units. Ask your dealer—if he can't supply, send seventy-five cents to.

THE CHASLYN COMPANY
4617 Ravenswood Ave., Chicago

COILS Special **GEN-RAL** PARTS Regular
REGISTERED

WRITE For The Four Tube Hook-up With THE GEN-RAL TEAM

NEW DUO-FOMER Five Tube Circuit Is Ready NOW

A Special Message

GENERAL MANUFACTURING CO.
6637 So. Cottage Grove, Chicago

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ceiver can be operated on but two stages of radio-frequency amplification for local and semi-local reception. In this case, the antenna is connected directly to this binding post.

A loop aerial can be used by removing the first inductance coil and plugging the loop into the jack (J) provided for this purpose.

If the outdoor aerial employed is exceptionally long and it is desired to increase further the selectivity of the set, the "electrical length" of the aerial can be decreased by opening the knife switch (S1) which introduces a condenser (C3) in series with the aerial. Normally, this switch should be closed.

This receiver is designed to employ 201-A or 301-A vacuum tubes for the radio-frequency amplifiers and the detector; although any of the new detector tubes can be employed to advantage in the detector socket. 201-A or 301-A tubes can be used also in the first three stages of audio-frequency amplification; but a power tube, such as the 112 or 171, should be employed in the last stage amplifier.

Radio-Frequency Amplification

(*Continued from page* 510)

The writer believes firmly that sets of the near future will quite upset the idea that 3 to 5 tubes are sufficient. Good quality, reliability and small gain per stage may well mean 6 to 15 tubes per receiver.

This line of attack at once brings forth the question, why *low-loss* parts in an R.F. amplifier? If we are not concerned, and it does not seem that we are, in large gain per stage, why increase the tendencies to oscillate by using large-diameter, large-wire, low-loss transformers and expansive open-faced condensers? Many advantages, from the viewpoint of small gain per stage, until we learn more may be secured by using, say one-half-inch diameter small-wire-coils, small closed-field condensers, and wiring that can cause no feed-back troubles.

RESONANT-WAVE COIL AMPLIFIER

It may be that some type of hook-up will be forthcoming to satisfy our present needs and this I believe may be very soon. We have not yet exhausted all of the possibilities from this angle; and the writer feels that the point will be well taken if he shows a hook-up he has never seen in print, which he developed to satisfy a conviction that the restriction in U. S. Patent No. 1,113,149 covering a tuned input and a tuned output could be driven around.

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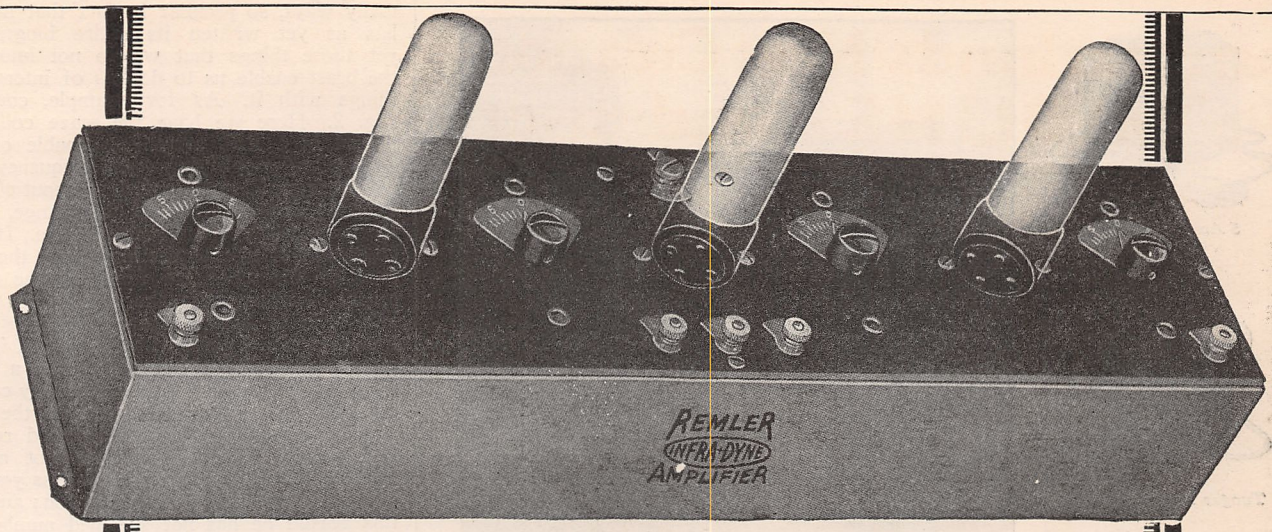


You can't be Satisfied with less

Amplification at its best is what you get when you hook the Remler Infradyne Amplifier up with your tuned radio-frequency set.

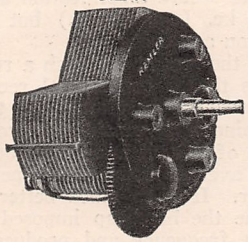
At last you can get the reception you demand—Sensitivity and selectivity are raised to new standards of perfection—Signals so weak that they are ordinarily inaudible are received with loud speaker volume when they pass through the Remler Infradyne Amplifier.

A new and effective control of energy transfer thru tube capacities at high frequency gives surprising results.

Make your old set a 1927 model

Ask your dealer for full information about the application of the Remler Infradyne Amplifier to your present set. He has—or can secure—full instructions.

NEW



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Stations spread over 360°—Body capacity eliminated—Perfect balance—Adjustable minimum capacity.

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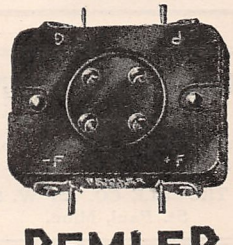

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Close, positive, gripping contact—Full floating springs—Brass contact levers—Meets the exact requirements of the X-type tubes.

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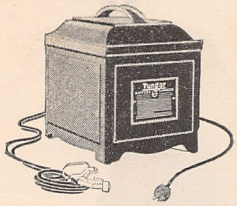
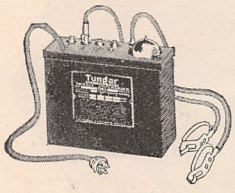


5 Ampere Tungar



Tungar Trickle Charger

Charging *now* simplified

When Tungar charges your batteries just by the turn of a switch, how easy it is to keep batteries fully charged.

Nowadays, it is possible to have a Tungar *permanently* installed. Then you can place the batteries in a cabinet, a closet, or down in the cellar, and just have a convenient switch to throw when they need charging.

It's as simple as snapping on a light. And an overnight charge costs less than a dime.

Tungar is the original bulb charger. It is a G-E product developed in the Research Laboratories of General Electric.

The 2 and 5 ampere sizes will charge 2, 4 and 6 volt "A" batteries, 24 and 96 volt "B" batteries, in series; and auto batteries, too. No extra attachments needed.

East of the Rockies
2 ampere Tungar—$18
5 ampere Tungar—$28
Trickle Charger —$12
(115 volts—60 cycles)

General Electric Company
Merchandise Department
Bridgeport, Conn.

Tungar
REG. U.S. PAT. OFF.
BATTERY CHARGER

Tungar—a registered trademark—is found only on the genuine. Look for it on the name plate.

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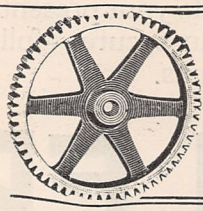
St. Paul, Minn.



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A resonant-wave coil is a peculiar cuss in many ways, so peculiar in fact that no one has as yet written its entire biography: yet those things that we do not know of the beast enable us to do lots of interesting things with it. As for example, consider Fig. 2. Here we have the wave coil employed in a R.F. amplifier, capable of receiving and amplifying radio frequency signals at from 50 to 600 meters without change of coil; and even beyond this range, were the coils designed for such purpose. It will be noted that neither the inputs nor the outputs of the tubes are tuned in the usual sense. Neither does the circuit use low-loss coils or bothersome condensers. Note that the coils are shown as connected in the plate circuits of the tubes. Only a little imagination is needed to see that they can be connected in many other ways, in the grid circuits, etc., and substantially good results be obtained. The writer does not advise building this circuit, however, unless you are quite familiar with wave-coil action; and for this reason he has not specified number of coil turns, etc. A typical form of resonant-wave coil nevertheless, is shown in Fig. 3.

The circuit is stable, invariably "fires" the first time, amplifies nicely, and possesses many other advantages; but, as it stands, it has the ability to receive a *wave and its harmonics at the same point* or same setting of the sliders. For instance, 400 meters, 200 100 and 50 meters will all tune at the same point. Remove this fault and you have a circuit that is indeed most interesting.

DOUBLE-GRID TUBES

In last issue the writer spoke of using double-grid tubes in R.F. amplifiers. A source of supply for these tubes has been secured and we are working day and night in order to have ready for our next article a discussion of a circuit using such tubes. It would seem from the theory of the thing, borne out so far by experiment, that small gain per stage, quality, distance, through many stages and *elimination of tube feedback*, may run hand in hand with the double-grid tube. The securing *advantageously* of small gain per stage can only be accomplished if we are sure that we are not gaining in one stage and losing in another, so that our total gain is fair but our circuit is all out of balance or cooperation.

We must know definitely that we are not losing in any stage and unless we know this by measurement, constructively speaking, we are liable to be wasting our time. That this is so may be illustrated by the fact that the writer has built strictly according to directions, all of the popular superheterodynes, with three intermediate stages and all; yet a good commercial 5-tube receiver, with a first detector and oscillator added, has equalled any of them as a superheterodyne. It is easier to secure amplification at 50 kc. than at 500 kc. (600 meters) but do you know that you are doing it?

Of course the reason for such a result, as just cited, is that a commercial receiver is generally about the best amplifier that the company behind it is capable of producing; and, because of this, it is a better-developed job than the average home-built superheterodyne receiver. It is so much better that it can overcome the handicap imposed by the difference in frequency and produce better amplification, selectivity, etc.

HE'D BEEN THERE BEFORE

"—what are you taking your radio to the football game for?"

"—well, if I get the same seat that I had last time, I'll need it to follow the game."

THE UNSILENT DRAMA

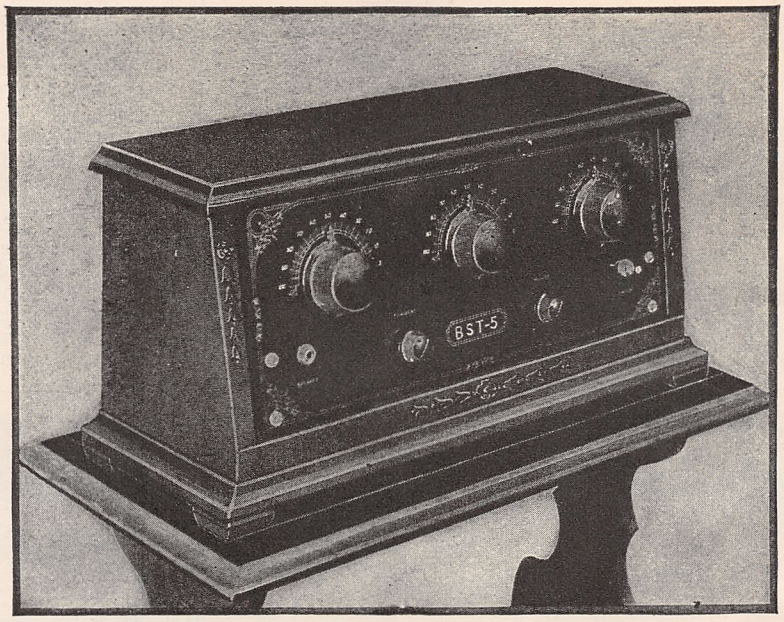
We'd hate to live in the same house with some of the radio actors if they slam the door when they leave the room the way they do in the radio dramas.

RADIO NEWS and RADIO WORLD give Certificates of Merit to the BST-5

BST-5

5-ply walnut vernier piano finish cabinet

$40.00



NEW MODEL

Shielded Receiver

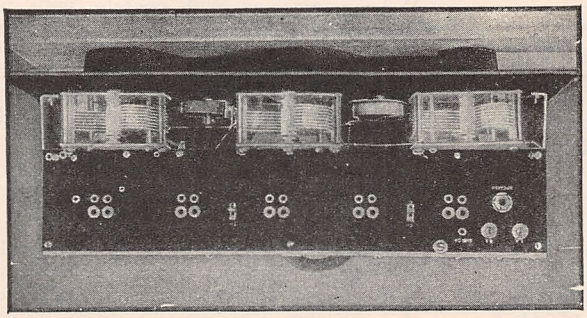
$40.00

New model cabinet base 21" long by 8" wide, height 9½", top 21" by 6".

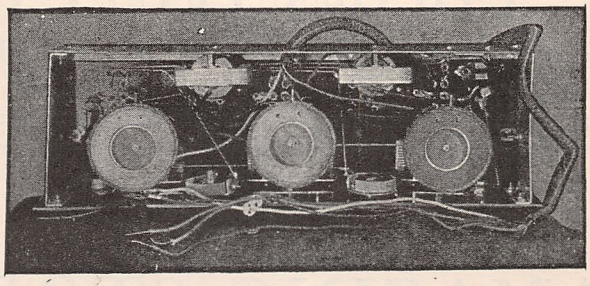
THIS highly sensitive, powerful and selective BST-5 radio receiver has all up-to-the-minute improvements. Heavy aluminum automobile type chassis, shielded against stray currents and distortion. Flexible grip, Universal type sockets, eliminating microphonic noises. Has provision for battery eliminator and any power tube. Fahnestock clips on sub-panel for adjusting C battery, has voltages for power tube. Efficient on either long or short aerial, including indoor aerial. This BST-5 sets a new standard for true tone values and selectivity. This BST-5 gives greater volume than many six tube sets and consumes less current.

28 Stations in 3½ Hours

Mr. E. H. Thiery, Tax Collector, New Hartford, Conn., writes: "I am well pleased with my BST. In three hours and a half on Wednesday night I got the following stations: WTIC, WJZ, WGY, WBZ, WPG, WNAC, WMSG, WEEI, KDKA, WAAM, WEAN, WSAR, WJBI, WMAC, WLWL, WJAR, WAHG, WBNY, WEAF, WNJ, WCSH, WSAN, WHK, WMCA, WRVA, WHN, WHAR, WWJ.



Top inside view showing compact aluminum shielded indestructible chassis.



Bottom inside view showing improved foolproof curkoid coils and rigid construction, with complete harness for simple installation.

Guarantee Satisfaction or Money Back

Each receiver is tested and retested, boxed and inspected before leaving factory, and guaranteed to reach you direct in perfect condition.

Workmanship throughout guaranteed the best. Assembled by experts. IMMEDIATE DELIVERY.

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Gentlemen:—Ship me one BST-5, $40.00 Radio Set, for which I enclose $40. I am to test it out for ten days in my own home and if not satisfactory to me I will return the set at the end of the ten days' trial and you are to return my $40 immediately on receipt of the set without question.

NAME .....

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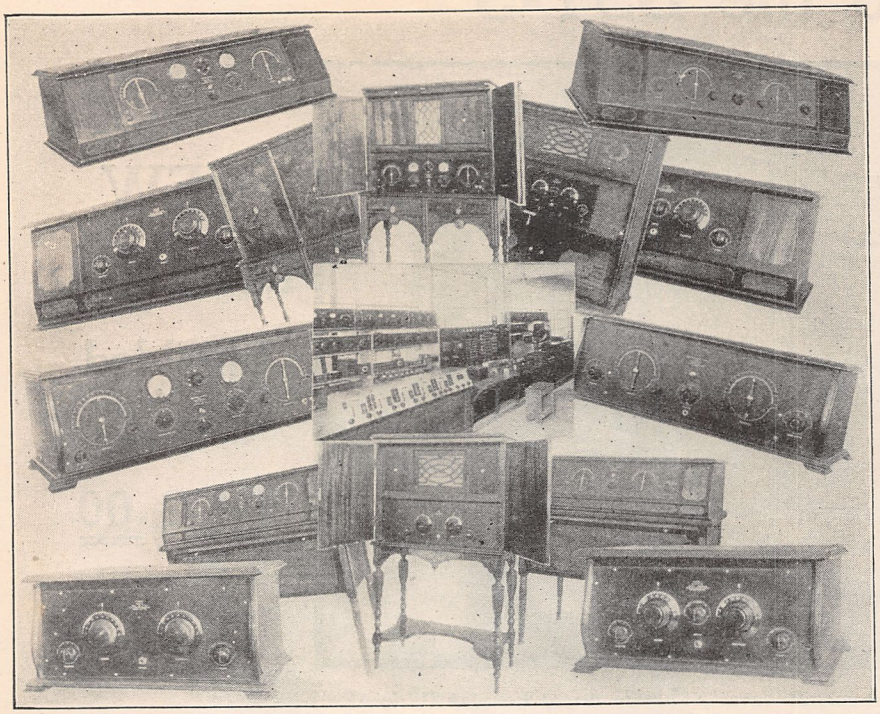
21 MODELS
100 Cabinet Styles



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Outstanding Features:

Wavelength Range—35 to 3600 meters.
Designed for new UX200A Super-Sensitive detector tube.
Adaptable to UX112, UX171 or UX210 power tubes in last audio stage.
Power audio, amplifier incorporated in every set.
All important parts manufactured in our own factory.
Special filter provided to eliminate "B" current from the loud speaker.
Voltmeter and switch to read "A", "B" and "C" voltages, 8 readings.
Milliammeter supplied to adjust bias voltages.
10 wire cable, separate "B" taps for radio, detector, audio and power audio.
Special antenna coupling circuit for extremely high selectivity.
Chassis type internal construction for rigidity and permanence.
Master workmanship and the finest parts used throughout.
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25c -- ON ALL NEWSSTANDS

A Trip Through a Condenser Factory

(*Continued from page* 481)

condensers in various circuits, are interested in the methods used in the construction of these condensers, a series of illustrations is here presented, which will give a clear idea of the steps of production.

KEEPING DUST AWAY

The building in which the filter condensers are made, was first carefully sealed in order to eliminate any possibility of dust or other elements entering the premises. Illustration No. 1 shows the power winding machine which was developed by the company's engineers. This machine is completely enclosed as a further assistance to keeping any foreign particles away from the paper and foil during the winding operation, and operated by a direct-current motor controlled by the treadle as shown. A revolution-counter is readily visible at the middle of the winding mandrel, and informs the operator at all times as to the exact number of turns in the condenser. A few of the windings are shown at the left of the machine;

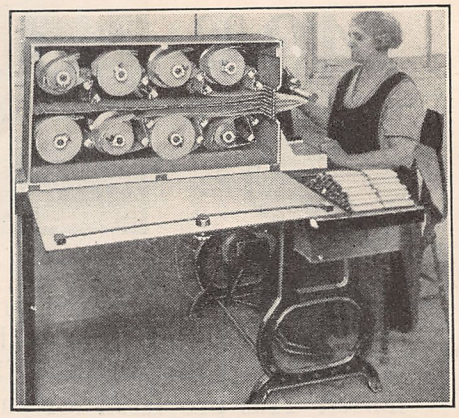

Fig. 2. Here are shown the spindles on which the paper and foil for the condensers are placed, prior to winding.

they have just been removed from the mandrel and pressed slightly to stack them for further operations.

No. 2 is a side view of the winding machine, showing the spindles on which are placed the rolls of condenser tissue and foil.

These spindles are set on ball bearings, as well as the foil and paper guides; so that the machine will operate with minimum friction and give a uniform tension in the condenser windings. The "tensionators," shown resting on the tops of the respective rolls, also assist in keeping the paper and foil at the proper tension. This view illustrates the side cover of the machine in a horizontal position, though in actual operation it is vertical and completely enclosed and protects the rolls.

No. 3 shows another view of the winding machine from the right side, as well as the operator winding a condenser on the mandrel. The eight large handles on the side of the machine are used to align properly the spindles on which are mounted the foil and paper. The sixteen small studded projections align the ball-bearing guides for the paper and foil.

PARAFFIN IMPREGNATION

No. 4 shows the impregnator equipment, with the vacuum dryer at the left and condenser for the dryer next to it. The steam boiler is slightly in the rear, and behind it is the vacuum pump that operates the dryer. In the same room at the right (Fig. 5) is the impregnating chamber and at the left of it is the liquor tank, in which the paraffin is

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7 Tube Set
Single Dial Radio

The Metrodyne

ONLY ONE DIAL TO TUNE

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$75
Completely Assembled
Big Discounts to Agents and Dealers

Wonderful offer direct from the factory! The world's greatest radio.
A perfect working, single dial control, 7 tube receiver. And just to prove our claims, we will ship it to your home for **30 days' free trial.** Test it under all conditions. Test it for distance, volume and tonal quality — and if you are not convinced that it is the best single dial set you ever heard, return it to the factory. We don't want your money unless you are completely satisfied.

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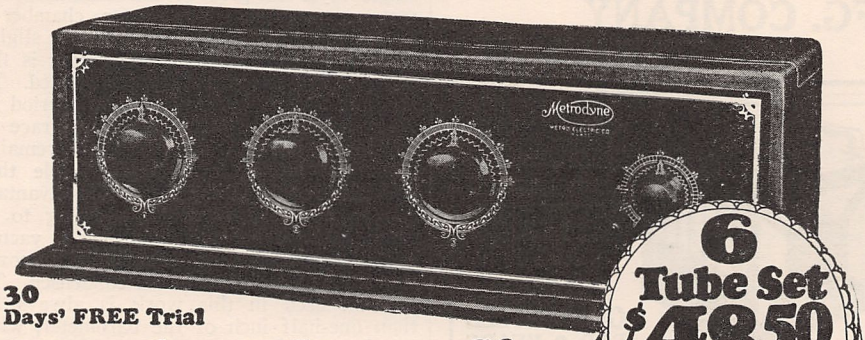
Metrodyne Super-Seven Radio

A single dial control, 7 tube, tuned radio frequency set. Approved by America's leading radio engineers. Designed and built by radio experts. Only the highest quality low loss parts are used. Magnificent, two-tone walnut cabinet. Artistically gilded genuine Bakelite panel, nickeled piano hinge and cover support. All exposed metal parts are beautifully finished in 24-k gold. Easiest set to operate. Only one small knob tunes in all stations. The dial is electrically lighted so that you can log stations in the dark. The volume control regulates the reception from a faint whisper to thunderous volume, 1,000 to 3,000 miles on loud speaker! The Metrodyne Super-Seven is a beautiful and efficient receiver, and we are so sure that you will be delighted with it, that we make this liberal **30 days' free trial offer.** You to be the judge.



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6 Tube Set $48.50 RETAIL PRICE *Completely Assembled*

Metrodyne Super-Six

Another triumph in radio. Here's the new 1927 model Metrodyne 6 tube long distance tuned radio frequency receiving set. Approved by leading radio engineers of America. Highest grade low loss parts, completely assembled in a beautiful walnut cabinet. Easy to operate. Dials easily logged. Tune in your favorite station instantly on same dial readings every time. No guessing.

Mr. Howard, of Chicago, said: "While five Chicago broadcasting stations were on the air I tuned in seventeen out-of-town stations, including New York and San Francisco, on my loud speaker horn, very loud and clear, as though they were all in Chicago."

We are one of the pioneers of radio. The success of Metrodyne sets is due to our liberal **30 days' free trial offer,** which gives you the opportunity of trying before buying.

MAIL THIS COUPON or send a postal or letter. Get our proposition before buying a radio. Deal direct with manufacturer— **Save Money.**

Mail COUPON Below!

Let us send you proof of Metrodyne quality

F. L. Warnock, Greentown, Ind., writes: "I received the Metrodyne in good shape and am more than pleased with it. Got stations 2,000 miles away."

C. J. Walker, Mariposa, Calif., writes: "Received my Metrodyne Single Dial set O. K. I believe that these one-dial sets are going to be excellent sellers. I had no trouble in tuning in stations enough to satisfy anyone, so you will please send me another set."

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We will send you hundreds of similar letters from owners who acclaim the Metrodyne as the greatest radio set in the world. A postal, letter or the coupon brings complete information, testimonials, wholesale prices, and our liberal **30 days' free trial offer.**

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If you are interested in AGENT'S proposition, place an "X" in the square ➡ ☐

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No. R25-28 Filament Meter

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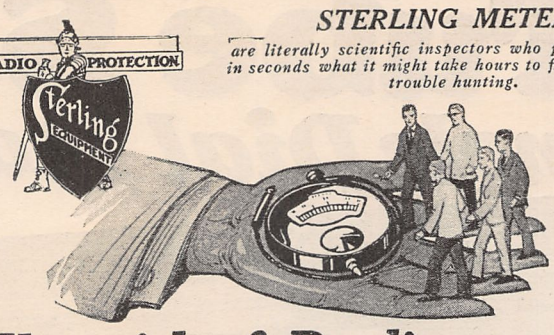
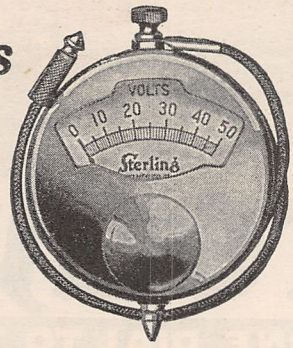
No. R-406 Universal Tube Tester

STERLING METERS

are literally scientific inspectors who plainly tell you in seconds what it might take hours to find by ordinary trouble hunting.



The aid of Radio Scientists at your finger tips



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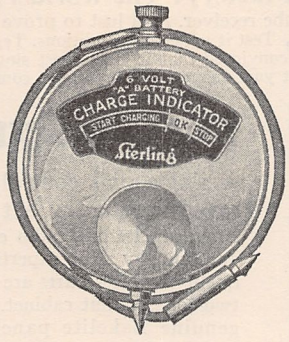
Anyone can use a Sterling Pocket Meter. Just as easy as telling time. Always accurate—never overdrains battery current during tests.

It tells whether the batteries you purchase are fresh or shelf-worn. You can know at all times whether your batteries should be used any longer or be discarded. It finds troubles in the circuit—an all round helpmate.

Made in all types, Price $1.00 to $4.00



CHARGE INDICATOR

Here is the clean, quick, accurate way to read storage "A" battery conditions. The Sterling Charge Indicator shows at a glance whether your "A" Battery is low or O.K. for use, approximately how long it can be used before recharging is necessary and when it has been charged enough.

Price $2.00

Most radio dealers have Sterling Pocket Meters and Charge Indicators in stock or can get them for you.

Write for 32-page descriptive booklet on Care and Upkeep of Radio. It's Free!

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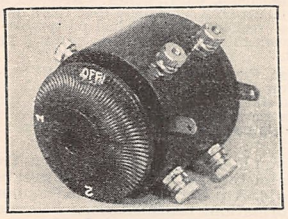

The Rono Multi-Stage Jack and Filament Switch

The Rono eliminates all jacks and push-pull plugs and attendant wiring and soldering. The Rono dial controls the batteries and both audio stages. Each stage a filament control. Recommended by Radio Engineers, Editors and Fans—Single hole mounting—Will outlast the receiver—absolutely efficient—saves time, labor and parts. You will never use another jack after you see the Rono. Get one at your Dealers today.

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If your Dealer cannot supply you order direct, enclosing $2.50 or we will ship C. O. D.

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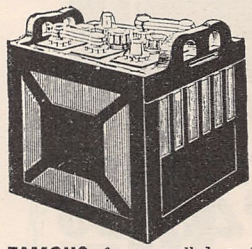
Rono Mfg. Co., 428 S. Clinton St., Chicago



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6 volts, 100 amps. ..... $ 8.29
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heated and retained under a vacuum, preparatory to its being drawn into the impregnator through the steam jacketed valve between these units. Back of the liquor tank and impregnator is the condenser, behind which is the combination vacuum and pressure pump which is also used with these units.

The vacuum dryer's door is open with a tray of condensers projecting slightly, in order to show the manner in which they are placed for this operation. An idea of the size of this dryer is gained from comparison with the room, which has a fourteen foot ceiling; and from the weight of the dryer which is slightly over twelve thousand pounds. The impregnator chamber is 36 inches in diameter and 30 inches deep; so that, with its supporting legs and cover raised, it is about 9 feet over all in height. With the liquor tank, this unit weighs approximately ten thousand pounds.

The vacuum and steam gauges are shown

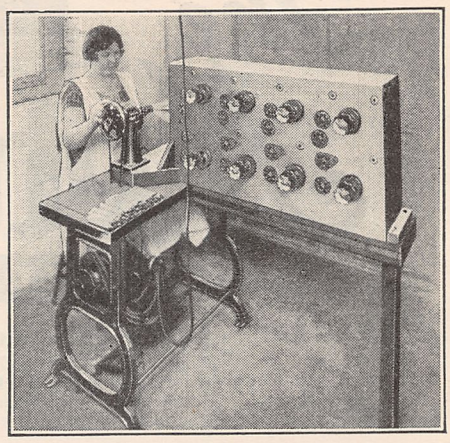


Fig. 3. Here is another view of the winding machine. The large handles on the side are used to align the spindles, so that the paper and foil will be distributed evenly in the condenser.

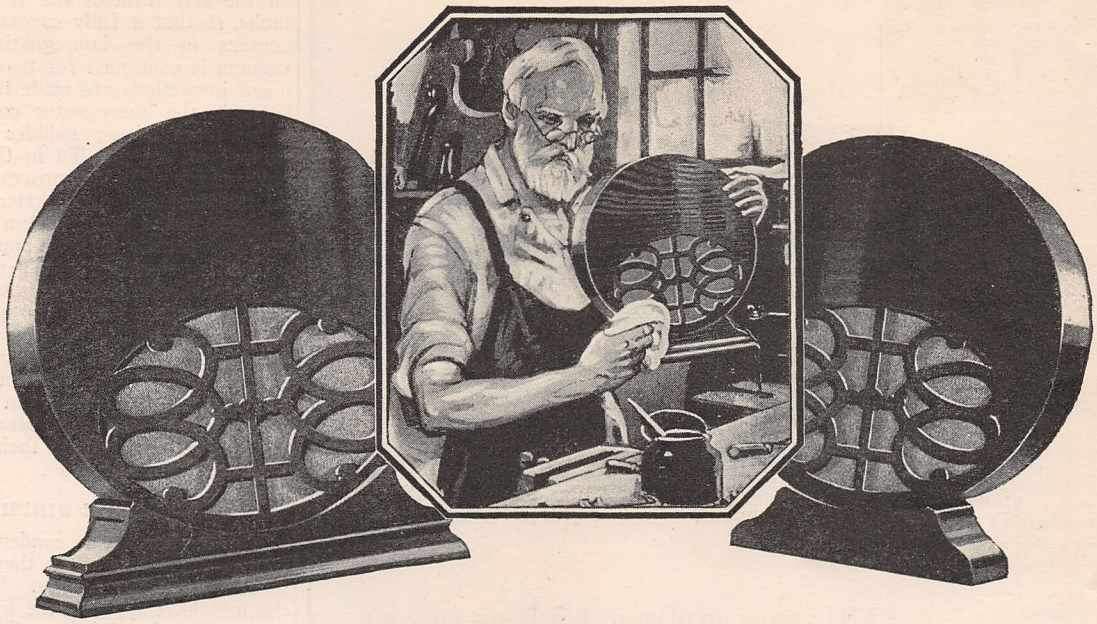
on top at the left of the dryer; they give the operator the true condition in the inside of the chamber at all times, and are supplemented by an additional peep hole shown just above the center of the open door.

After the condensers are wound they are placed in the vacuum dryer on trays in a single layer to give as much heating contact as possible. The dryer chamber is heated about one hour, with the door slightly open to let moisture out. The door is then clamped and the vacuum pump started. The vacuum is maintained for a period of four hours, and removes any trace of moisture which may have remained after the baking operation. While these operations could be combined, it is advantageous to do them separately; owing to the small amount of radiation in a vacuum and the necessity of completely removing any trace of moisture in the condenser. The vacuum used in this work is always less than one-half inch of the barometer, which can be considered almost a perfect vacuum under production conditions.

The condensers are then stacked individually between metal plates and after the tops are bolted on, they are brought in a hydraulic press to a pressure of two thousand pounds per square inch. By controlling this pressure to an exact degree, the capacities of the finished condensers are made uniform.

An operator places the condensers in their clamps in the impregnating tank, after which the lid is lowered by the crane shown above it and bolted securely. The condensers are again baked for a brief time to remove the moisture they may have picked up during the pressing operation, after which the vacuum pump is started and brought to within one-half inch of the baro-

BUILT LIKE A VIOLIN



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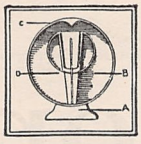
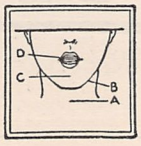




Buy Teletone for complete radio-speaker satisfaction. Two charming models to suit your fancy. Two prices to suit your purse — only $32.50 or $22.50 for the very most that radio has to offer.

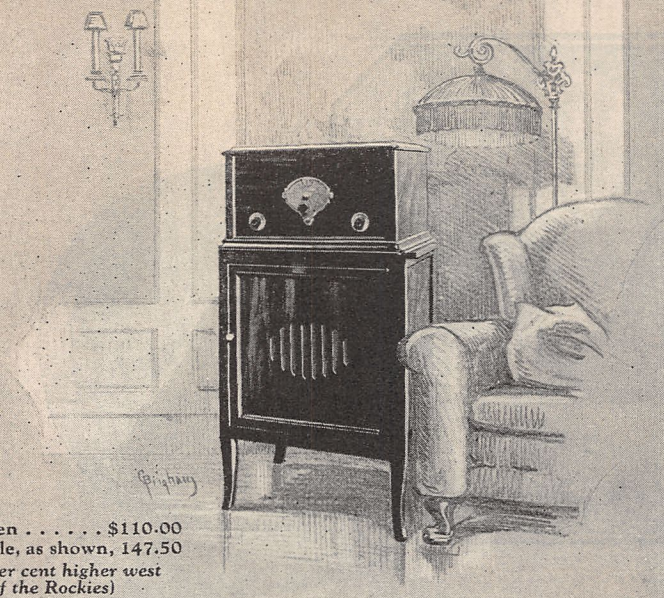
Note that a sound-wave coming from the sound producing unit "A" (the human vocal cords) is amplified through the orifice. "B" (the human larynx) until it reaches the conducting area "C" (the back of the throat), whence it is again conducted to the point of greatest amplification "D" (the correctly formed and opened mouth of the singer).

TELETONE CORPORATION *of* AMERICA

449-453 West 42nd Street, New York City

TELETONE

Radio speaker



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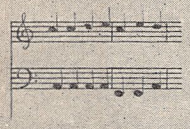

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meter. When all trace of moisture and air has been removed by the vacuum in the impregnator (which requires two hours) the paraffin is drawn from the liquor tank on the left through the valve between the tanks, so that it fully covers all of the condensers in the impregnating tank. The vacuum is continued for two hours and frequent inspections are made through the peep holes in the impregnator cover, until there is no trace of air bubbles coming to the surface of the paraffin in the impregnating tank, which definitely proves the removal of all moisture and air. After the paraffin is returned to the liquor tank a pressure of one hundred pounds is then applied to the impregnating chamber for a period of one hour, after which the chamber is cooled to 160° F. This operation forces the paraffin into the condensers and the cooling sets it, to prevent what is termed "bleeding," as it is very important to have a uniform layer of paraffin between each layer in the condenser. The cover is then lifted from the impregnator and the clamps with their condensers are removed for cooling.

TESTING THE FINISHED PART

No. 6 shows the condensers in various testing operations after they have been removed from the clamps. The operator in the middle is applying the first test which is for voltage breakdown. The "testing pencils" may readily be noted in each hand, directly connected to the switchboard, which in turn is operated by the motor-generator under the right end of the bench. This "flash test" eliminates all condensers which will not stand the voltage for which they were made, and is particularly important in "B" eliminator work, which requires a condenser that will stand up under continued use.

The operator at the right is using a microammeter, which is also directly connected to the switch board, for testing the insulation resistance which is over one hundred megohms on all these condensers. The operator at the left is making the third

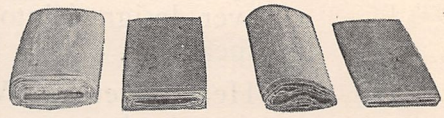


Fig. 7. At the left is shown the appearance of a 2-μf. condenser before and after the paraffin impregnation. The other two windings are for 1-μf. condensers.

testing operation, by means of a microfaradmeter which is directly operated on 110-volt, 60-cycle alternating current. All commercial condensers must test within 10%, plus or minus, of their rated capacity; and those which are outside of these limits are rejected.

A GOLDEN OPPORTUNITY

"I tink it's time ve got a tube set, fader." "Vy do you say dat, mein son?" "Vell, fader, I read in a paper dey are going to start broadcasting checks!"

News of the World.

THE RIVALS

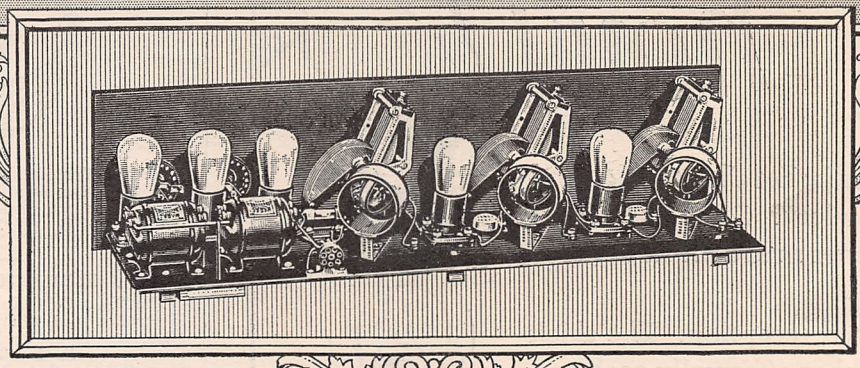
The wind was feeling very vexed,
It whistled, "Well, whatever next?
I've always tried to do my work,
And yet, although I never shirk,

"Young radio sets, I grieve to say,
Are most impertinent today,
Because they copy what I do—
When I start howling, they howl too."

Leslie M. Oyler in Wireless Magazine.

Something *NEW & AUTOMATIC* in Radio!

The Karas Equamatic Five Tube Sensation



Licensed under King patents pending

Radio Broadcast's Feature Circuit for 1926-27

SET builders all over the country have responded with great enthusiasm to the first announcement of the KARAS EQUAMATIC SYSTEM as embodied in the Karas Equamatic 5-Tube Sensation. They at once realized that this radically new circuit offers results THAT NO OTHER FIVE TUBE SET HAS EVER APPROACHED.

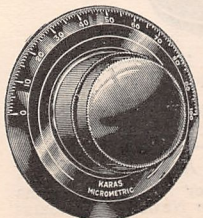
With the Karas Equamatic System it is for the first time possible to take full advantage of the amplification factor of your tubes AT ALL WAVE LENGTHS FROM 200 to 600 METERS. Those who have built the Equamatic Receiver have discovered that it produces a pure, full-strength signal ANYWHERE WITHIN THIS RANGE, plus a SELECTIVITY, TONE QUALITY and VOLUME never before realized.

How is this high efficiency obtained?

In the Karas Equamatic the tubes operate CONSTANTLY at their highest efficiency—just below their oscillation point. The secret of this receiver's remarkable efficiency lies in its solution of the baffling problem of CONSTANTLY AND AUTOMATICALLY varying the coupling between primary and secondary inductances so as to provide an ABSOLUTELY EQUAL TRANSFER OF ENERGY at all wave lengths. Karas is FIRST to offer this new radio sensation to the set builder, just as Karas was FIRST to manufacture an audio frequency transformer that amplifies all notes and all frequencies equally, and also was FIRST to design and supply the straight frequency line condenser that relieves congestion by spreading stations evenly over the dial.

The Equamatic Principle of Operation

The inventor of the Equamatic System, by means of an extremely simple mechanical method, has made it possible to AUTOMATICALLY VARY the coupling between primary and secondary inductances in exact step with the variation of the condenser plates by merely turning the condenser dials in the ordinary process of tuning.



Karas Micrometric Dial. Price $3.50

Primaries and Secondaries Entirely Separate

In the Equamatic Five Tube Sensation primaries are ENTIRELY SEPARATE from secondaries, being mounted on the special extended shafts of the condensers. The secondary coils are mounted on the sub-panel on adjustable brackets. By an ingenious swivel joint in the primary mounting, combined with the adjustable feature of the secondary coil, it is possible to vary not only the degree of coupling but also to ABSOLUTELY, UNVARINGLY AND AUTOMATICALLY control the rate of coupling so that in the Equamatic there is an absolutely CONSTANT AND EQUAL transfer of energy between primary and secondary coils at EVERY WAVE LENGTH setting of the dials.

A New Sharpness and Selectivity

Due to this PERFECT coupling between primary and secondary inductances at all dial settings, and the positions and angles at which coils and condensers are placed, there is no overlapping of electrostatic and electromagnetic fields with their harmful broadening and distorting effects. As a result, the Karas Equamatic is as sensitive as a regenerative set, as selective as a super-het, and its tone is as clear as a crystal!

Amazing Power, Volume and Tone

This NEW Karas Equamatic Receiver has a powerful, clear as a bell tone, and wonderful volume. It possesses a quality of tone which makes it the most faithful of all multi-tube receivers in its closeness of approach to the actual broadcast production.

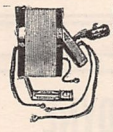
The Equamatic is Easy to Build

You can build this powerful, clear-toned, long-range receiver easily and quickly EVEN THOUGH YOU NEVER HAVE BUILT A SET BEFORE. With every set of Karas Equamatic Coils is included a complete manual of simple diagrams and instructions showing where to place every part and telling you exactly how each connection is made. This manual also gives you a full detailed and completely illustrated explanation of the systems. To build this receiver you will need the Karas parts listed below, plus other standard parts you can easily secure.

Order From Your Dealer or Direct FROM US

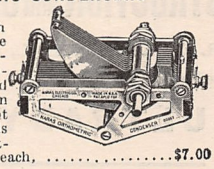
Karas Equamatic parts are carried in stock by reliable dealers in most cities. If your dealer happens to be out of stock you may order direct from us by using the coupon below. Send no money. Just pay the postman the price of the parts plus a few cents postage.

Essential Parts of the Karas Equamatic Sensation



KARAS EQUAMATIC INDUCTANCE COILS are packed three in a carton, and come to you with complete manual of simple diagrams and instructions, all necessary nuts, screws and binding posts, ready for mounting in your receiver. Price, set of three coils, $12.

KARAS SPECIAL 17 PLATE ORTHOMETRIC CONDENSERS



three of which are used in the Equamatic Receiver, have special extended shafts upon which to mount the primary coils of the Inductances. Price, each, ...$7.00

KARAS HARMONIK AUDIO FREQUENCY AMPLIFYING TRANSFORMERS

are essential to the tone quality success of the Equamatic Receiver. Two of these are used for the two stages of audio frequency amplification. Price, each, ...$7.00

KARAS EQUAMATIC RETARD COILS, two of which are used, were designed especially for the Equamatic System. Price, each, ... $1.00

KARAS EQUAMATIC SUB PANEL BRACKETS. To insure the necessary exact positions of primary and secondary coils these brackets are essential. Price, set of three, ... 70c

KARAS MICROMETRIC DIAL. It has a 63 to 1 vernier and tunes to 1/1000 of an inch. Price $3.50

KARAS ELECTRIC COMPANY,
1128 Association Building, Chicago, Illinois.

Please send me set of 3 Equamatic Inductance Coils, $12.00; 3 special Orthometric Condensers with extended shafts, $7.00 each; 3 Micrometric Vernier Dials, $3.50 each; 2 Harmonik Audio Transformers, $7.00 each; 2 Equamatic Retard Coils, $1.00 each; and 3 sub-panel brackets, 70c, for which I will pay postman $60.20, plus postage, upon delivery. It is understood that I have the privilege of returning any of this apparatus for full refund any time within 30 days if it does not prove entirely satisfactory.

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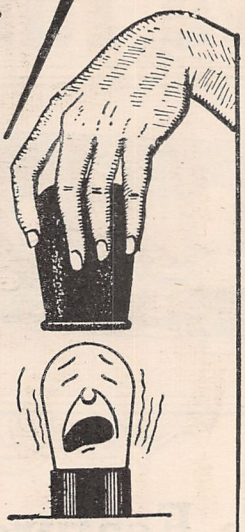
CITY ..... STATE.....

(If cash accompanies order we will ship postpaid.)

KARAS ELECTRIC COMPANY

1128 Association Building **CHICAGO**

stop that howl!



SEE that rubber jacket about to descend on the "howler"? Once this "howl absorber" slips over a tube the howl stops for once and all!

No more ruined reception. The thick shield of live rubber effectually soaks up the trouble-making vibration.

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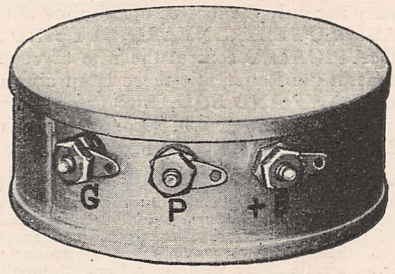

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Widely adaptable to all leading control units.
This transformer is compact, sturdy, sharp-tuning. Prevents both outside and local interference.

PRICE $2.00

There are Sickles Diamond-Weave Coils for all leading circuits.

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136 UNION STREET
SPRINGFIELD :: MASS.

GOLD from idle hours!

Read "MONEY MAKING" the Magazine of Opportunities
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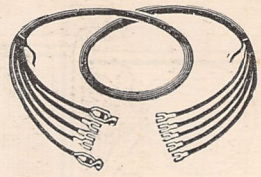
Radio Laboratories

(Continued from page 517)

"A" & "B" BATTERY CABLE

The 5-Wire "A" & "B" Battery Cable shown, submitted to the RADIO NEWS LABORATORIES for test by the Birnbach Radio Co., 370 Seventh Ave., New York City, consists of five insulated stranded wires braided into a single cable. These wires are rubber-insulated, covered with braids of

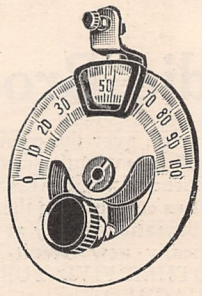


different colors, and have connecting lugs at each end. The two heavier wires for the "A" battery current are provided with sturdy tinned clips.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1448.

ILLUMINATED CONTROL

The "Mar-Co" Illuminated Control shown in this illustration was submitted to the RADIO NEWS LABORATORIES for test, by the Martin-Copeland Co., Providence, R. I. The main feature of this vernier dial is that it is arranged for back-panel

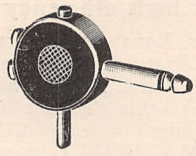


mounting and that the instrument under control can be mounted on the dial frame. The dial is provided with a special knob to control a flashlight lamp directly behind the engraved translucent scale.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1554.

PHONE PLUG

The "Reverso" Phone Plug shown, submitted to the RADIO NEWS LABORATORIES for test by the Zisch Engineering Corp., 39-43 Avenue L, Newark, N. J., has for a characteristic feature that it is

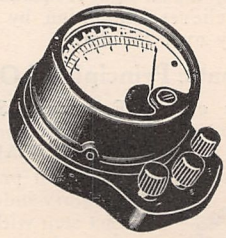


provided with a small push-button switch, which allows changing the polarity of the cord tips without disconnecting them from the plug.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1555.

VOLTMETER

The Model 489 Voltmeter shown, submitted to the RADIO NEWS LABORATORIES for test by the Weston Electrical Instrument Corp., Newark, N.



J., is a high-class testing instrument, precise, solid and reliable; it is adapted for two voltage ranges, 0-7½ and 0-150.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1559.

OUTDOOR CAGE ANTENNA

The "Washington Outdoor Cage" Antenna shown, submitted to the RADIO NEWS LABORATORIES for test by the D-S Radio Corp., 1630 Fourth

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8-Page log book of all U. S. Broadcast Stations

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Lugs, nuts, dials, vernier dial, jacks, plugs, every kind of knob, cords, panels, screws, sliders, washers, selenium, tinfoil, switches, crystals, cap nuts, Litz wire, cord tips, brass rods, resistances, name plates, spring binding posts, switch parts, metal ribbon, carbon balls, binding posts, all types, switch points, switch levers, lock washers, carbon grains, ground clamps, metal pointers, insulated tubing, low melting metal, antenna connectors, bus bar wire, as well as thousands of other articles.

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All Armstrong Circuits: These important circuits are explained clearly, all values having been given. Just to name a few of the Vacuum Tube circuits: The V.T. as a detector and one-step amplifier; Super Regenerator; one-step radio frequency amplifier and detector; three-stage audio frequency amplifier; short wave regenerative circuits; 4-stage radio frequency amplifier; radio and audio frequency amplifier; inductively coupled amplifier; all Reflex Circuits. This catalog is crammed full of small parts and radio findings, literally thousands of them. In addition there is much useful information contained herein.

If you will paste this coupon on a post card and mail today, we will be pleased to send you our new Catalog at once.

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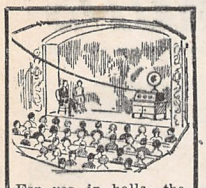
HERE'S 100 feet of ¼ in. wide FLAT bare, copper wire, with insulator on outer end, reeled up in a handsomely nickeled metal case, 4¼ in. diameter. Weighs only 21 ounces. Fits pocket. Unreel as long an aerial as desired, place case on or near set, insert plug on cable in center hole—attach other end of cable to set—and tune 'em in. Unused portion in case does not cause dead end losses. When through, reel in like a tape measure. No tangling. Provides 100% efficient aerial in a few moments — any time, any place — indoors, outdoors.

PAT. APPLIED FOR

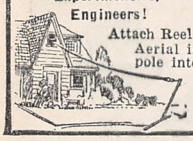
½ Size Illustration
Actual size of Case 4¼ in. diameter
Insulator

UNSURPASSED PERMANENT AERIAL! Reel Aerial antenna has same inductance value as stranded copper wire. Being flat, smooth, and easy to take down, it is easily cleaned.



For use in halls, theatres, laboratories, schools, clubs, on trains, at fairs, etc.

For indoor aerials—can be put up around walls or reeled out on floor.



Experimenters, Engineers! Attach Reel Aerial insulator to a pole and push pole into ground. Bring antenna into house. By changing distance and locations of pole, and reeling antenna in or out you can vary antenna.

DEALERS! JOBBERS! Write for attractive proposition. Use Reel Aerials in making trial demonstrations. Sell Reel Aerials for indoor aerials, portable sets to travelers and tourists, to experimenters and to people desiring highly efficient permanent aerials.

SEND NO MONEY, JUST MAIL COUPON

HAWKEYE RADIO CO., Division of Hawkeye Lightning Rod Co., Dept. 1411, Cedar Rapids, Ia.

Ship me—on your MONEY BACK GUARANTEE—one Reel Aerial C.O.D. I will pay postman $5 plus few cents postage (postage prepaid when money accompanies order).

Name .....

Address .....

Goodrich Silvertown
Radio Panels
For greatest range and selectivity

1 Easier to drill and machine.
2 Better color, lasting lustre.
3 Lower free sulphur—no discoloration.
4 Higher softening point—no warping.

Goodrich V. T. Sockets *Spaghetti Tubing*
Radiophone Ear Cushions *Battery Mats*
Hard Rubber Tubes for Coils

The B. F. Goodrich Rubber Company
Established 1870 Akron, Ohio

FREE RADIO GUIDE

FREE RADIO CATALOG & GUIDE for 1927. Gives special hook-ups with illustrations. Shows savings on standard radio parts, complete sets, kits. Be sure to get this thrifty book before you buy. Write letter or postal NOW. Also include name of another fan.

BARAWIK CO., 542 Monroe St., CHICAGO, U. S. A.

COIL WINDINGS

Audio-B Eliminator—Bell Ringing Trans.
TELEPHONE RINGER—CHOKE—IGNITION—CONTROLLER & SPECIAL SOLENOID WINDINGS

Easton Coil Co. P. O. Box 237 Easton, Pa.

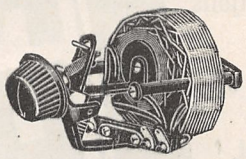
Ave., Seattle, Wash., consists of two aluminum discs, eight stranded wires with threaded lugs at the ends, and a short insulating pipe. The discs have threaded holes in their centers for holding

supporting pipes, and evenly-distributed small holes for the lugs of the wires.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1560.

MICRO-COUPLER

This Micro-Coupler, submitted to the RADIO NEWS LABORATORIES for test by the Simplex Radio Devices, 231 Mulberry St., Newark, N. J., is a three-circuit tuner with windings of the self-supporting type. The coupling between the primary and the secondary can be adjusted by sliding the rods supporting the secondary and passing through

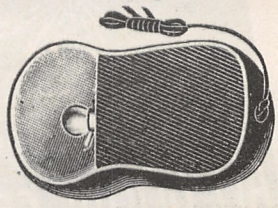


the winding of the primary. A rough variation of the coupling between the secondary and the tickler is obtained by sliding the primary along the rods rigidly attached to the frame of the tuner; a finer adjustment by varying the inclination between the axis of the tickler and that of the primary.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1561.

RADIO PANEL LAMP

The radio panel lamp shown, submitted to the RADIO NEWS LABORATORIES for test by Robert A. Stevenson, 412 E. King St., Lancaster, Ohio, consists of a porcelain housing with a hidden 6-volt

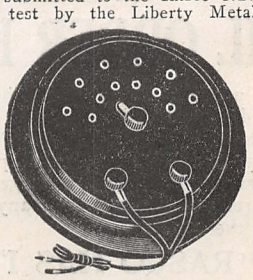


flashlight lamp, which illuminates the radio panel when placed on top of the cabinet. The lamp is provided with a small lever which brings the lamp in lighting position.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1562.

LOUD-SPEAKER CONNECTOR

The "Liberty" Multiple Loud-Speaker Connector shown, submitted to the RADIO NEWS LABORATORIES for test by the Liberty Metal Products



Co., Berea, O., has a simple switching arrangement making it easy to connect to the receiver any of the reproducers attached to this device.

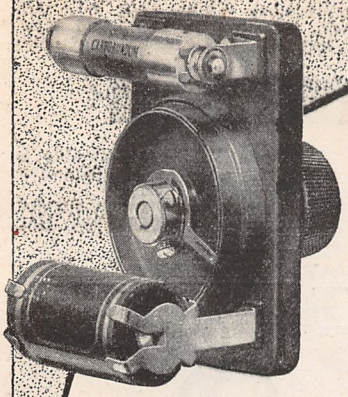
AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1563.

RHEOSTAT

The Frost Radio Bakelite Rheostat, Nos. 806 and 802, shown herewith, was submitted to the RADIO NEWS LABORATORIES for test by Herbert H.

Frost, Inc., 154 West Lake St., Chicago, Ill. The main feature of this type of rheostat is that its bakelite base is so shaped that it comes in contact with the resistance unit only over a very small surface, thus causing efficient cooling. The contacts are perfect and the whole is compact and solid.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1564.



Radio Reception is only as good as its Tone Quality

VOLUME means nothing if it brings only distorted noise. Distance means nothing if you are not rewarded by tone quality. Equip your set—no matter what type—with the Carborundum Stabilizing Detector Unit and you are assured of crystal clear tones—of a quality reproduction you have never before enjoyed.

The Unit is built around the Carborundum Permanent Detector. No adjustments—no bothering with a jumpy cat's whisker. This detector is fixed under a five pound pressure—retains its super sensitivity—it won't burn out.

A booster voltage is supplied by a tiny dry cell and by a potentiometer control you adapt the unit to the circuit and receiving conditions.

Increases selectivity—gives greater distance and volume—but above all brings you true natural tones.

THE CARBORUNDUM STABILIZING DETECTOR UNIT

Reg. U. S. Pat. Off.

Improves Any Set

Send for the Special Hook-up Booklet

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

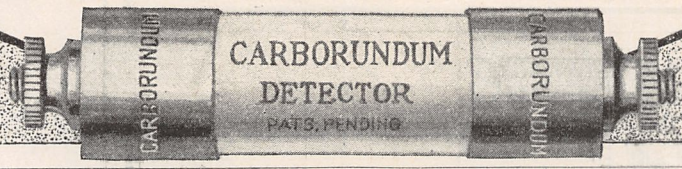
SALES OFFICES AND WAREHOUSES IN New York, Chicago, Boston, Philadelphia, Cleveland, Detroit, Cincinnati, Pittsburgh, Grand Rapids, Milwaukee

The Carborundum Company, Ltd., Manchester, Eng.

$3.50 IN U.S.A. Dealer or Direct

DETECTOR ALONE $1.50

Carborundum is the Registered Trade Name used by The Carborundum Company for Silicon Carbide. This Trade Mark is the exclusive property of The Carborundum Company.



The Carborundum Company Niagara Falls, N.Y.

Please send free Hook-Up Book D-1.

Name_____

Street_____

City_____ State_____

Afraid of his shadow!

NOT long ago the American Automobile sales-managers were skeptical of the Export Market to Spanish-speaking countries. They imagined great difficulties of distance, exchange, translation and distribution. But they were only *afraid of their shadow*—as is proven by the fact that the sales of American Automobiles to this market totaled $75,000,000 for 1925.

LATIN AMERICA
SPAIN-PORTUGAL
THE WEST INDIES
THE PHILLIPPINES

RADIO INTERNACIONAL

RADIO NEWS in Spanish

SELLING Radio in this market is a much simpler proposition than once faced the Automobile Manufacturers. RADIO INTERNACIONAL—solves *the distribution* problem by affording direct contact with buyers in this market. It solves the translation problem by its staff of experts who translate letters *for you;* and it maintains a Service Department for advice on exchange, sales outlets, etc.

There is an *All-Season market* in these countries—July is as good as December—

THESE PEOPLE PREFER AMERICAN APPARATUS. GET YOUR SHARE OF THIS BUSINESS

EXPERIMENTER PUBLISHING CO., Inc., - - - - - - - 53 Park Place, New York

Publishers of Radio News, Science and Invention, Radio Internacional, Amazing Stories, Radio Review

Western Representative — FINUCAN & McCLURE — 720 Cass Street, Chicago, Ill.
Kansas City Representative — DAVIES, DILLON & KELLY — 15 West 10th St., Kansas City, Mo.
New England Representative — T. F. MAGRANE — Park Square Bldg., Boston, Mass.
Detroit Representative — ROY BUELL — Donovan Bldg., Detroit, Mich.
Pacific Coast Representative — A. J. NORRIS HILL CO. — 5 Third Street, San Francisco, Calif. / 412 W. 6th Street, Los Angeles, Calif.

"BELIEVE *ME*, MISTER, YOU HAVE THE GOODS!"

A radio dealer whose name will be furnished upon request quotes:

"I can show two verifications from real foreign stations—and not on Test Week either—and have letters out now asking for three more!

"I have the Quadraformer set beside one of the best known makes of supers, of which I am the authorized dealer, and the Quadraformer outperforms it every time."

Wonderful reception. Unusual for even the Quadraformer; but it does show what the Quadraformer will do when our simple assembly instructions are faithfully followed.

The fact is undeniable; in every section of the country, radio enthusiasts are turning to the Quadraformer —hundreds of them every month.

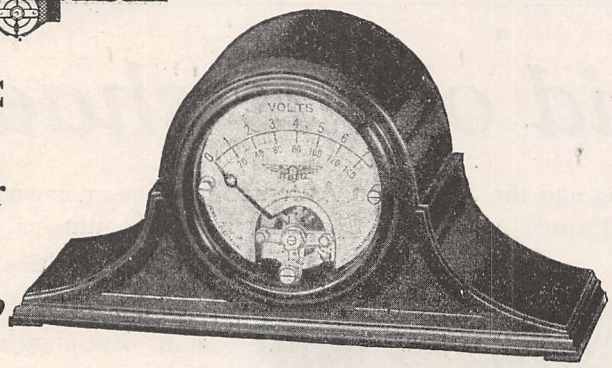
A number of revolutionary advantages have been attained. The total absence of all stabilizers, resistances, and other neutralizing devices allows all the radio energy to be utilized in developing the true signal. Speech and music come in with rich, sweet tones. There is little or no back-ground of noise. There is no distortion. Distance seems to make little difference.

You can easily build this wonderful five tube receiver yourself. You need only the Quadraformer essential kit which sells for $12.75 and a few other standard parts. Send 10c today for the QUADRAFORMER BOOK which tells the whole story. Please mention your dealer's name.

GEARHART-SCHLUETER RADIO CORP.,
Fresno, California

JEWELL

No. 135-C
Portable Voltmeter
"De Luxe"



This is without question the most artistic and useful portable radio voltmeter manufactured. 90% of all radio trouble can be traced to faulty tubes and batteries. Check—control them. Send for special circular No. 1016.

Jewell Electrical Instrument Co.
1650 Walnut St. *27 Years Making Good Instruments* Chicago

MASS. RADIO SCHOOL
18 Boylston St., Boston, Mass.
NEW TERM NOVEMBER 8
Send for Free Catalog

Investigate Our Trial Offer

Positions Secured Licensed Graduates

Insure your copy reaching you each month. Subscribe to Radio News—$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

RADIO-FREQUENCY CHOKE COIL

The Radio-Frequency Choke Coil, type 132, shown herewith, submitted to the RADIO NEWS LABORATORIES for test by the Radio Engineering

Laboratories, 27 Thames St., New York City, is of small size and is very effective. Its inductance is nearly 1 millihenry.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1567.

VACUUM TUBE

The type "H" Vacuum Tube shown, submitted to the RADIO NEWS LABORATORIES for test, by the C. E. Company, 702 Eddy St., Providence, R. I.,

is for use as a detector only. It is of the 201-A type, and employs a plate voltage of 67 to 90. It gave excellent results on test.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1568.

VACUUM TUBE

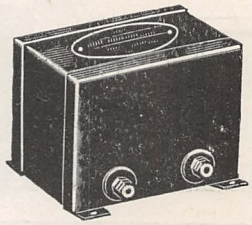
The Vacuum Tube shown, submitted to the RADIO NEWS LABORATORIES for test, by the Quali tron Mfg. Co,. 527 Morgan Ave., Union City, N.

J., is of the 201-A type and can be used as either a detector or an amplifier. It gave excellent results on test.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1569.

AUDIO-FREQUENCY TRANSFORMERS

The "Concertone" Audio-Frequency Transformer shown was submitted to the RADIO NEWS LABORATORIES for test by the Jefferson Electric Co., 426 S. Green St., Chicago, Ill. It was found that,

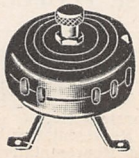


when the transformer was used in conjunction with a 201-A tube and with the proper plate and grid voltages, voltage amplification per stage was practically the same at low as at high frequencies.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1570.

CHARGING RHEOSTAT

The Charging Rheostat shown, submitted to the RADIO NEWS LABORATORIES for test by the L. S.



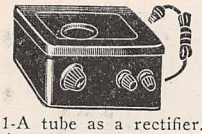
Brach Mfg. Co., 127 Sussex Ave., Newark, N. J., allows control of the amount of the current by which an "A" battery is charged through a trickle

charger. It has a resistance of 60 ohms, is mounted in a porcelain housing and so arranged that a perfect cooling of the resistance unit is assured.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1571.

"B" BATTERY ELIMINATOR

The "U-Flex" "B" Battery Eliminator shown, submitted to the RADIO NEWS LABORATORIES for test by the U-Flex Mfg. Co., 1 South 39th St., Philadelphia, Pa., works on alternating currents

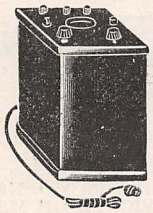


and uses a 201-A tube as a rectifier. It has been tested in conjunction with a 5-tube radio receiver; no hum or distortion was heard, and the supplied current was sufficient to allow a satisfactory volume.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1574.

"B" ELIMINATOR

The "Aero" "B" Eliminator shown, submitted to the RADIO NEWS LABORATORIES for test by the Glenn L. Martin Co. (Radio Division), Cleveland, Ohio. is very compact and of solid construction, working on A.C. It uses as a rectifier a 201-A

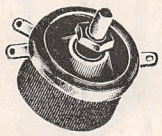


or 213 tube. The output is fairly pure so that no distortion or hum is heard; the current supply is high enough to operate satisfactorily a receiver having three stages of resistance-coupled audio amplification.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1575.

RHEOSTAT

The "All Metal" Rheostat type 210 shown, submitted to the RADIO NEWS LABORATORIES for test by the De Jur Products Co., 199 Lafayette St., New York City, is of the one-hole mounting type. With a few exceptions, it is almost entirely of

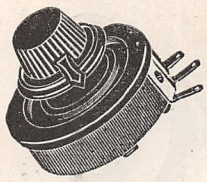


metal, thus avoiding the overheating of the resistance unit. The sliding contact arm runs smoothly and makes a perfect contact with the resistance wire in any position. Screws and nuts are eliminated, as only built-in lugs are used.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1576.

POTENTIOMETER

The Type 114 Potentiometer shown, submitted to the RADIO NEWS LABORATORIES for test by the De Jur Products Co., 199 Lafayette St., New York City, is designed for large current-carrying

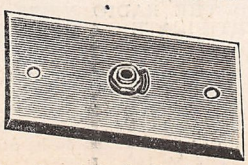


capacity and has a resistance of 1,000 ohms. The contact between the sliding spring and resistance unit is good in all positions.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1577.

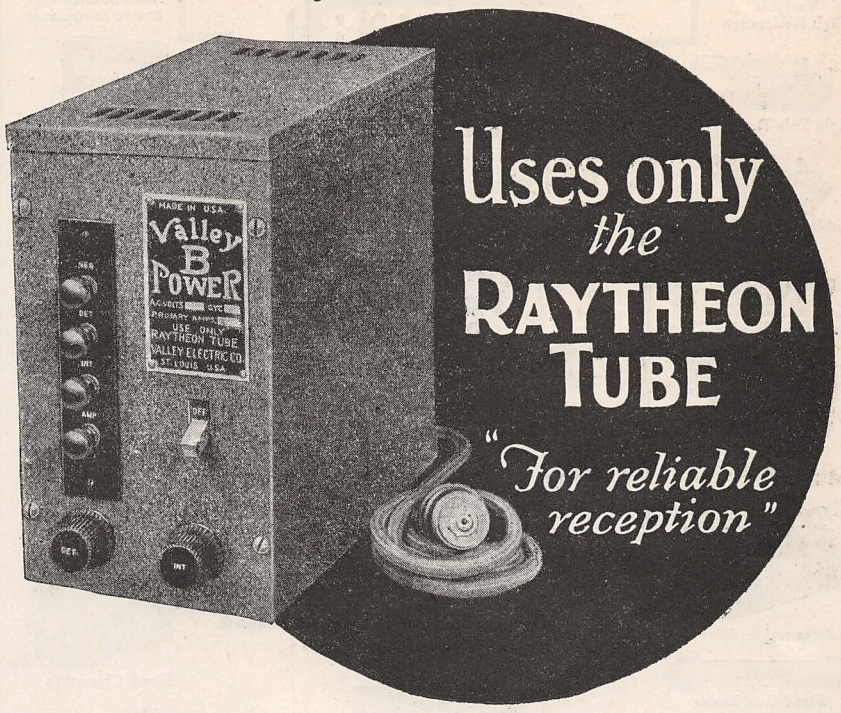
RECEPTACLE JACK

The Type 600 Receptacle Jack shown, submitted to the RADIO NEWS LABORATORIES for test by the



Carter Radio Co., 300 S. Racine Ave., Chicago, Ill., is a complete radio outlet for use in wiring

Valley Electric



Delivers 50 milliamperes at 180 volts

Operates without hum or noise
Better than dry batteries

The Valley B Power Unit takes the place of B batteries by providing plate voltage from the house lighting circuit for any radio receiving set of 12 tubes or less.

It will supply the plate voltage necessary for a power unit or power tube. Its maximum output is 50 milliamperes at 180 volts.

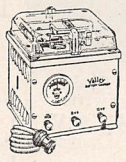
We use the Raytheon Tube in the Valley B Power Unit because only the Raytheon Tube gives full wave rectification and has no filament to burn out. Also, it is the only rectifying tube for this service which will deliver full current and voltage continuously over a long period of time.

Operates without hum or noise—as silent as dry batteries. Mounted in handsome black grained metal case. Comes complete with Raytheon Tube, cord and plug.

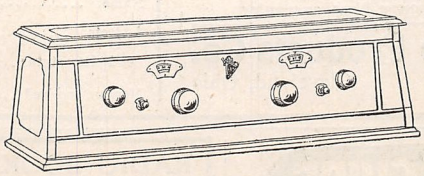
Other Valley Radio Units

To the left are shown other Valley units as follows:

Top—The Valley Type TBC Charger, the twin-bulb charger. Charges at 2½ amperes with one bulb, and at 5 amperes with two bulbs. Use of both bulbs is optional. Absolutely noiseless.



Center—The Valley Type ABC Battery Charger. The original vibrator type charger. More than 200,000 in successful use. For six and 12 volt batteries.



Bottom—The Valleytone Model 52 Radio Receiver. Five-tube, tuned radio frequency. Two dial control. Wired so that use of power tube is optional.

VALLEY ELECTRIC CO. · RADIO DIVISION · ST. LOUIS, MO.

District Offices: Boston, Chicago, Cleveland, Indianapolis, Kansas City, Minneapolis, New York, Philadelphia, San Francisco

Build Your Set With

MUTER

Dependable Products

Endorsed and used by leading set builders

Quality at Popular Prices

May we send you our complete catalog? Write Dept. R.N.

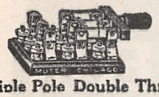
LESLIE F. MUTER COMPANY
76th & Greenwood Avenue
CHICAGO, ILL.

MEMBER R.M.A.

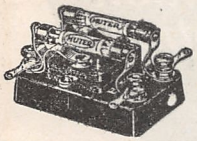
Variable High Resistance

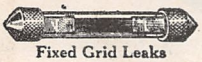
Single Pole Double Throw

Double Pole Double Throw


Triple Pole Double Throw

Antenna Plug


Resistance Amplifier Unit


Fixed Grid Leaks

Resistance Amplifiers

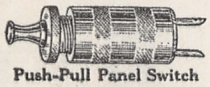
Adjustable Ground Clamp

Standard Complete Aerial Kit

Variable Condensers

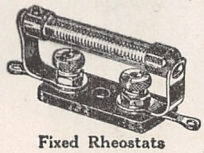
Interference and Static Eliminator

Audio Frequency Transformers


Push-Pull Panel Switch

Automatic Shock-Proof Phone Plug

Fixed Condensers


Fixed Rheostats

Lightning Arrester

Antenna Lead-In Insulator

Clayton "B" Eliminator

New battery pep every day in the year.

Operates direct from light socket.

110-120 volts A.C. Any Cycle

Replaces your Radio "B" Batteries.

Dealers write.

$11.75 Complete. Nothing else to buy.

Works on any set—new or old.
Costs little more than a new set of batteries

Ruggedly built with dependable, tested, quality parts in a handsome, heavy steel cabinet.

No Acid, Hum, Noise, Attention. Will last for years.

Greater volume and sweeter tone.
Costs less than 50c *a year to operate.*
Works on any set up to eight tubes.

Full wave rectification. Taps at 22, 45, 90V.
100 *Volts Maximum*
No wiring changes necessary.
Do away with battery troubles forever.
Sold on a ten day money back guarantee.

Clayton Radio Products Co.
3539 Broadview Rd. Cleveland, Ohio

USE THIS ORDER COUPON NOW.

CLAYTON RADIO PRODUCTS CO.
3539 Broadview Rd. - Cleveland, Ohio

Name .....
Address .....
Send literature..... City.....
Money enclosed..... Send C.O.D.....

FREE RADIO GUIDE

FREE RADIO CATALOG & GUIDE for 1927. Gives special hook-ups with illustrations. Shows savings on standard radio parts, complete sets, kits. Be sure to get this thrifty book before you buy. Write letter or postal NOW. Also include name of another fan.

LATEST HOOK-UPS

BARAWIK CO., 542 Monroe St., CHICAGO, U. S. A.

RADIO BOOKS & PATTERNS

BOOKS, PATTERNS AND DIAGRAMS ON EVERY IMPORTANT RADIO CIRCUIT

Write : For : Circular

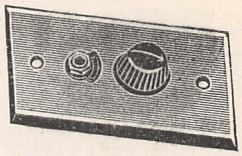
THE CONSRAD CO., Inc.
53 PARK PLACE NEW YORK

buildings. It consists of a short jack mounted on an insulated 2¼x4½ satin-finished brass plate. The insulation between the parts of the jack, and between the jack and the plate, is very high.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1578.

RECEPTACLE VOLUME CONTROL JACK

The Receptacle Volume Control Jack, No. 630, shown herewith, submitted to the RADIO NEWS LABORATORIES for test by the Carter Radio Co., 300 S. Racine Ave., Chicago, Ill., is composed

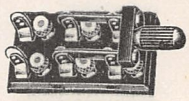


of a 2¼x4½ satin-finished brass plate on which a 500,000-ohm volume control unit and a short insulated jack are mounted.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1579.

KNIFE-EDGE SWITCH

The Knife-Edge Switch shown herewith, submitted to the RADIO NEWS LABORATORIES for test by the Leslie F. Muter Co., 76th Street and Greenwood Ave., Chicago, Ill., has a molded



bakelite base and nickeled brass contacts with moulded insulated handles. This switch is especially adapted for connection of battery circuits with surface mountings.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1581.

LOOP ANTENNA

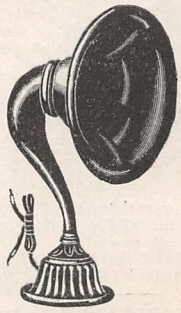
The "Quality Tone" Loop Antenna shown, submitted to the RADIO NEWS LABORATORIES for test, by the Duro Metal Products Co., 2699 N. Kildare Ave., Chicago, Ill., is of the collapsable type. By loosening a special screw, a bar of the frame can

be removed, thus allowing the folding of the loop. This antenna is very well built and operates satisfactory over the whole broadcast range, in connection with a .0005-μf. condenser.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1582.

LOUD-SPEAKER

The "Quality Tone" Loud-Speaker shown was submitted to the RADIO NEWS LABORATORIES for test by the Duro Metal Products Co., 2699 N.



Kildare Ave., Chicago, Ill. The reproduction of speech and music by this instrument is very fine and the volume is large.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1583.

TEST HANDLES

The Test Handles shown, submitted to the RADIO NEWS LABORATORIES for test, by the Universal Test Equipment Co., 2939-41 N. Oakley Ave., Chicago, Ill., were found to be of great aid in locating trouble in radio receivers. They can be used, either with a low-voltage battery in

series with headphones, or with the house lighting current in series with a lamp.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1584.

FIXED CRYSTAL DETECTOR

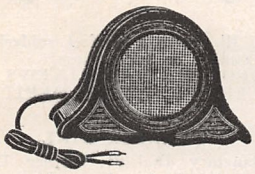
The Fixed Crystal Detector shown, submitted to the RADIO NEWS LABORATORIES for test, by the Advance Electric Co., 1200 W. Second St., Los

Angeles, Calif., was tested in connection with different crystal receivers and found to be very sensitive.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1585.

LOUD-SPEAKER

The "Stanford Model" Loud-Speaker shown was submitted to the RADIO NEWS LABORATORIES for test by the Magnavox Company, 2725 East Fourteenth Street, Oakland, Calif. This neat and



attractive reproducer is of the cone type. It responds very well over the audio-frequency band and gives excellent reproduction with regard to quality and tone.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1588.

LOUD-SPEAKER AND BASE

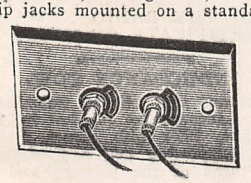
The "Rola Pedestral Re-Creator" shown herewith, submitted to the RADIO NEWS LABORATORIES for test by the Rola Company, Oakland, Calif., is identical with the instrument described in the

September issue of RADIO NEWS, except that instead of being of the table-mounting type it has a fancy wooden stand.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1591.

OUTLET JACK—AERIAL AND GROUND

The Outlet Jack—Aerial and Ground, No. 600, shown herewith, submitted to the RADIO NEWS LABORATORIES for test by the Carter Radio Co., 300 S. Racine Ave., Chicago. Ill., consists of two insulated tip jacks mounted on a standard 2¼x4½

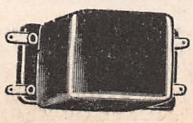


satin-finished brass plate. The insulation between the tips and the plate is very high and the capacity between them is negligible, so that reception is not affected. The jacks are provided with name plates.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1593.

IRON-CORE TRANSFORMER

The H-210 Iron-Core Transformer shown, submitted to the RADIO NEWS LABORATORIES for test, by the High Frequency Laboratories, 131 North

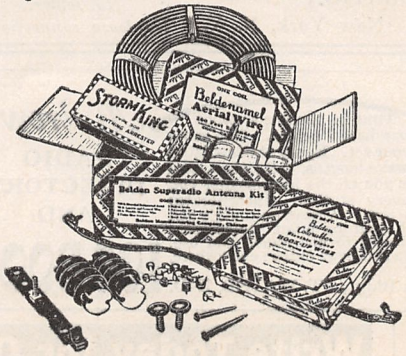


Radio Time is Here!

Don't Wait!

Put up your Beldenamel Aerial —this week!

DO you know that a clean, bright aerial wire gets louder volume and longer distance than a corroded, soot-covered aerial? The corroded, tarnished surface of a bare copper aerial wire interferes very seriously with the flow of radio frequency currents from the antenna to the set. That is why the shiny, smooth wires of a Beldenamel Aerial are protected with baked enamel.



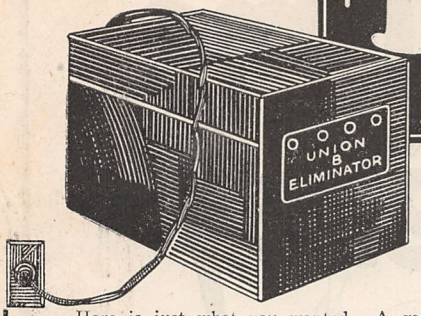
The Belden Superadio Antenna Kit contains a Beldenamel Aerial and other high grade aerial and ground parts.

If you install a Beldenamel Aerial, now, you will be through with aerial troubles for years to come. Smoke, fumes, and weather cannot affect the Beldenamel coating on a Beldenamel Aerial. That is why so many old, bare copper aerials are being replaced with Beldenamel Aerials.

Ask your nearest dealer to show you a Beldenamel Aerial. It is sold in a distinctive striped black-and-orange carton that protects you against substitutes.

BELDEN MANUFACTURING COMPANY
2314A South Western Avenue Chicago, Illinois

$10.98 Complete GUARANTEED



NOTE: We manufacture a complete line of Filter Condensers, Resistance, Choke Coils, and 7 tube one dial Truphonic Receivers. Prices on application.

Here is just what you wanted. A good reasonable priced powerful and clear B-eliminator with a two-year written guarantee and sold with the privilege of returning within 10 days if unsatisfactory. What better proposition can we offer?

Built sturdy in an approved polished metal container 9 x5¼ x 5¼. Shipping weight 5 pounds packed. Operates any set up to 8 tubes from 110, 120 volts A.C. socket any cycle, delivering a constant flow of unfailing clear noiseless B power. No more recharging, no troublesome creepy acid cells, but an instrument ready to function the minute you turn on the switch. It comes to you complete ready to work.

There are four taps B—, 22½, 45, (90-100). We can change the taps to suit your requirements on request with order. Higher voltage can be obtained by connecting any old B battery in series with the eliminator, but it hardly will be found necessary for reason of the high amperage.

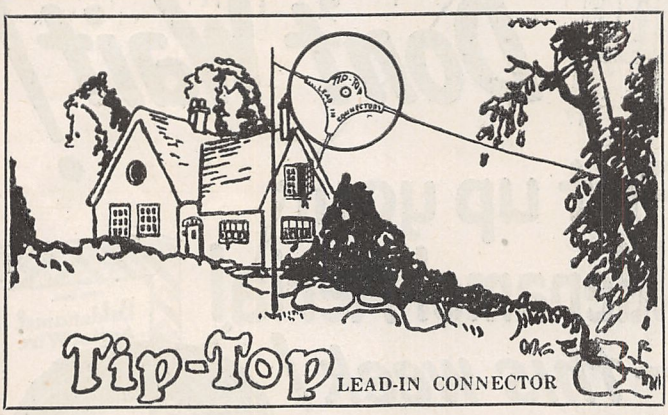
Our A battery eliminator to work in connection with our "B" will be announced later and priced about $16.50. Trickle charger for A Battery $6.50.

ASK YOUR DEALER TO DEMONSTRATE OR SEND DIRECT

Immediate delivery, no waiting. Wire money if you like. C.O.D. shipments require 25% with order.

UNION SERVICE COMPANY, FOUNDED 1912

MORRIS HEIGHTS P.O. BOX 23 NEW YCRK, N. Y.



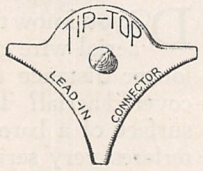
APPROVED RADIO NEWS LABORATORIES 1922

Don't Neglect this point of contact

Use a Tip-Top Lead-in connector on your outside aerial, for best distance results, and better reception.

Jobbers and Dealers write for discounts.

JAMES F. DOOLAN
MANUFACTURING CORPORATION
36 - 42 West 47th Street : New York, N. Y.



25c

Only a screwdriver needed.
No solder.
No loose connections.

Get more stations Easier with

Tune in obscure stations never heard before. Get more out of your set. Every station listed 3 ways—wave lengths, call letters, and cities. Gives you all the information you want about every station. Incorporates Broadcast Station map. Always up-to-date and authentic as it is checked by latest Government Reports. Simple and easy to understand and use. Each station can be individually logged. Sold by radio and news dealers everywhere, or by mail, postpaid on receipt of 25 cents in stamps.

THE WAYNE ANDREWS CO., 1103 Andrews Bldg., FT. WAYNE, IND.

Andrews RADIO DIRECTORY AND LOG-BOOK

FREE RADIO GUIDE

LATEST HOOK-UPS

FREE RADIO CATALOG & GUIDE for 1927. Gives special hook-ups with illustrations. Shows savings on standard radio parts, complete sets, kits. Be sure to get this thrifty book before you buy. Write letter or postal NOW. Also include name of another fan.

BARAWIK CO., 542 Monroe St., CHICAGO, U. S. A.

Write Today for Our 84-Page Catalog of RADIO BARGAINS

RANDOLPH RADIO CORP.
180 N. UNION AV. Dept. 2 CHICAGO, ILL.

Wells Street, Chicago, Ill., has an iron core and is broad in tuning. It operates with maximum efficiency at frequencies between 40 and 32 kc., and may be used very efficiently in receivers of the superheterodyne type. The size of the instrument is small and its general appearance very neat.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1594.

AIR-CORE TRANSFORMER

In general appearance and size, the long-wave transformer H-215, submitted for test to the RADIO NEWS LABORATORIES by the High Frequency Laboratories, 131 North Wells St., Chicago, Ill., is identical with the H-210 type described above. It differs only in that it has an air core and its tuning, therefore, is much sharper. The maximum amplification is at 36 kc.

AWARDED THE RADIO NEWS LABORATORIES CERTIFCATE OF MERIT NO. 1595.

CONNECTORS

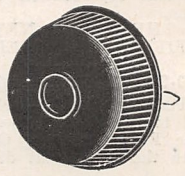
The "Suretite" connectors shown, submitted to the RADIO NEWS LABORATORIES for test by the McCall Novelty Co., 631 West Edwards St.,

Springfield, Ill., form a perfect solderless connection for stranded or solid wires.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1599.

VERNIER DIAL

The "Planetary Dialog" Vernier Dial shown, submitted to the RADIO NEWS LABORATORIES for test by the Walnart Electric Mfg. Co., 308 South

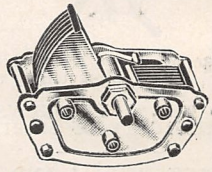


Green St., Chicago, Ill., has a vernier ratio of nearly five to one. It operates very smoothly and is easy to install.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1601.

VARIABLE CONDENSER

The "Metralign" Variable Condenser shown, was submitted to the RADIO NEWS LABORATORIES for test by the General Instrument Co., 477 Broadway, New York City. The characteristic feature of this excellent instrument is that, while the plates of

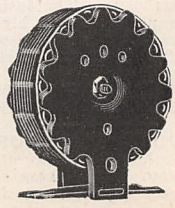


the rotor are semi-circular, those of the stator are so shaped that the condenser is a compromise between straight-line-frequency, capacity, and wave length.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1602.

INDUCTANCE COIL

The inductance coil shown, submitted to the RADIO NEWS LABORATORIES for test by Biderman's Radio Products, 1274 44th Street, Brooklyn, N. Y., is a self-supporting coil and of the Lorentz type. The turns of the primary and secondary



are held tightly together by the pressure of special-shaped fiber plates. When used in connection with a .00035-μf. condenser this coil will cover the entire broadcast range.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 1608.

A Battery Coupled Audio Amplifier

(*Continued from page* 506)

low, due to the high resistances employed. In the long run it costs no more to operate than the ordinary transformer-coupled amplifier. The blocking batteries supply no current; therefore the smallest type may be used.

CHOKE-COIL-COUPLED AMPLIFIER

As the connections of the choke-coil-coupled amplifier are the same as those of a resistance-coupled amplifier, tests were made with this amplifier, using blocking batteries instead of condensers and leaks. Such a circuit is shown in Fig. 3. Economy in the number of batteries required was effected by using separate "B" batteries for each tube. This was possible, due to the fact that the voltage drop across the choke coils (L) is not very great. The coils used had a D.C. resistance of 6500 ohms. Using "B" batteries of 90 volts the drop across the coil would be about 35 volts, assuming the internal impedance of the tube is 10,000 ohms. As this places a negative potential of 35 volts on the grid, the "C" batteries (B4, B5 and B6), connected with the positive terminal to the grids, are used to reduce the grid potentials to the proper value.

The apparatus used in this amplifier is illustrated on page 506 as Fig. 7 at the upper left. While this amplifier is superior to a choke-coil amplifier using blocking condensers, it has been found more critical in adjustment. If we could make choke coils without D.C. resistance, the critical feature would be eliminated.

When experimenting with battery-coupled amplifiers, it is important to space the coupling batteries at least one inch apart; otherwise the capacity effect between the coupling batteries may interfere with the amplification.

Radio News of The Month

(*Continued from page* 488)

"SPARKS" HONORED BY PRESS

THE Associated Press recently bestowed a gold watch, and a commission as an honorary member of its staff, upon Stedman Fiske Todd of Oakland, Calif., radio operator of the SS. *President Wilson*, who on Jan. 19 received and sent to the A. P. the thrilling story of the rescue by the *Java Arrow* of the crew of the Japanese steamer *Daishin Maru*.

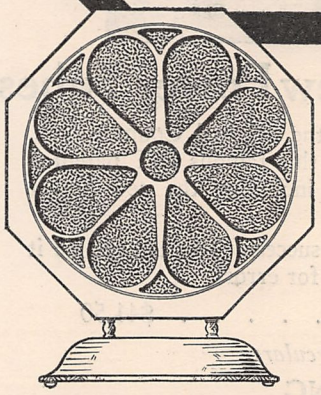
LIGHTER HEARTS IN LIGHT HOUSES

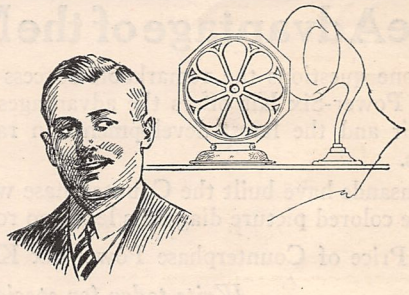
THERE is proverbially no more lonesome job in the world than tending a lighthouse, particularly one separated by stormy water from the mainland. The keepers are often isolated for months in narrow quarters. An appeal by Secretary Hoover has been answered by a prominent manufacturer with a gift of 200 five-tube sets and loud-speakers, sufficient to equip all the more important stations; and they will be no longer cut off from the outside world.

OUR RADIO EXPORT TRADE

OVER ten million dollars' worth of radio equipment was exported in 1925 from the United States, the Department of Commerce has recently announced; an increase of 80% over the previous year. Only one seventh of this amount went to Europe. One of the problems which confronts the

Try This! and you'll realize the Importance of your SPEAKER





$19.50

We ask you to make this test for your own benefit before you select any speaker — regardless of price. Walk into your dealer and ask him to connect one of his good receivers with any three speakers, including Octacone — and just for the sake of comparison be sure that the other two are *expensive* instruments.

Then turn your back on the apparatus as he plugs in each speaker. Notice the difference in their tones—especially on the very high and the very low notes. Watch for *naturalness* in reproduction. If you do you'll walk off with an Octacone at only $19.50!

Octacone is built just like the human ear. Its diaphragm is shaped just like the human ear. Its apex is slightly off center just as it is in the Tympanic Membrane or ear drum. It vibrates to sound exactly as the human ear. And don't forget this — Octacone's handsome metal cone-case will resist the roughest treatment and even though you drop it on a cement floor it will not be injured in the least!

Octacone is licensed under Frank E. Miller patent numbers 1,190,787; 1,220,669; 1,294,137. Other patents pending.

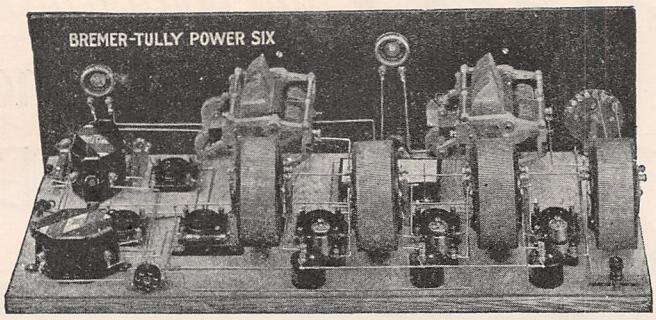
Send for interesting booklet, "It's Almost Human". If your dealer doesn't carry the Pausin Octacone write to Department F.

Pausin Engineering Company
727 Frelinghuysen Ave., Newark, N.J.

PAUSIN OCTACONE

The New Counterphase Power-Six

for the Home Set-Builder



Take Advantage of the New Power Tubes

No one questions the remarkable success of the original Counterphase. The Power-Six Kit offers the advantages of this famous B-T patented circuit and the latest developments in radio including the new power tubes.

Thousands have built the Counterphase with success. You too can do it —the colored picture diagrams leave no room for errors.

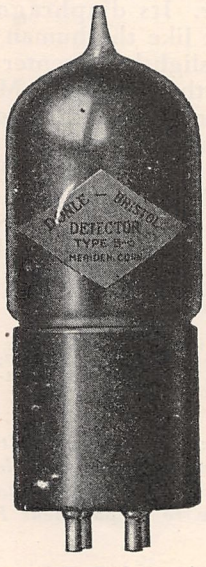
Price of Counterphase Power-Six Kit $41.50

Write today for special circulars.

BETTER TUNING

The 10th Edition describes the New Factory-built Counterphase Eight and the New Counterphase-Six,—B-Power Unit and all the new B-T parts including the New Power-Six Kit. You cannot afford to miss it! Price 10c.

BREMER-TULLY MFG. CO., 520 SOUTH CANAL ST. CHICAGO, ILL.



B-6 Tube
$5

EXTREMELY loose coupling with its consequent increased selectivity is made possible by the use of a sensitive detector. The B-6 detector is sensitive to impulses too weak to even affect ordinary detectors. We have developed a new circuit especially for the B-6 Tube. Details sent on request.

THE DONLE-BRISTOL CORP.
Meriden, Connecticut

FREE RADIO GUIDE

FREE RADIO CATALOG & GUIDE for 1927. Gives special hook-ups with illustrations. Shows savings on standard radio parts, complete sets, kits. Be sure to get this thrifty book before you buy. Write letter or postal NOW. Also include name of another fan.
BARAWIK CO., 542 Monroe St., CHICAGO, U. S. A.

LATEST HOOK-UPS

FREE — OUR 84-PAGE CATALOGUE. FILLED WITH RADIO BARGAINS. WRITE TODAY!
RANDOLPH RADIO CORP.
180 N. UNION AV. Dept. 2 CHICAGO, ILL.

American exporter is the enormous range of the broadcast wavelengths in Europe, over six times the width of the American broadcast band. Australia and New Zealand have been in late months the largest importers of American receiving sets.

FROM BROADWAY TO THE ARCTIC

EXCEPTIONALLY successful short-wave transmission has been effected between the schooner *Morrissey*, of the American Museum's Greenland expedition, off Ellesmere Land, and New York, through the radio apparatus of the *Times*, enabling the explorers to greet relatives. Communication was effected on ½-kw. power, the New York station transmitting on 40.6 meters and the expedition on 36. It was found that even brilliant displays of the aurora borealis did not interfere, though violent static had been expected.

REPORTING BY RADIO

DETROIT, which presented the United States with the first radio-equipped police force, promises another novel venture in radio for flashing news bulletins to the city's newspapers. Special licenses have been granted the Detroit Evening News for experimental work in this field. The call letters assigned are 8XN and 8XM.

COMPASS BEARINGS FOR AIRCRAFT

IN addition to the beacon system to be installed along the inland airlanes, the radio compass stations of the U. S. Navy, along the Atlantic coast, will be put at the service of aviators. The necessary work of calibrating them for directional service landward is being performed by the dirigible Los Angeles, beginning with the New England coast. Over 150,000 radio bearings were given to vessels of all classes last year by navy compass stations.

ENFORCING RADIO COPYRIGHTS

WITH the increasing use of radio by news agencies, has arisen the possibility of "pirating" the ethereal scoops. Resolutions have been passed by an organization of news gatherers, under the auspices of the League of Nations at Geneva, asking governments to co-operate in prohibiting the copying, as well as publication, of private telegrams and news dispatches.

What Chemistry Has Given To Radio

(*Continued from page* 496)

time of vulcanization might be speeded up as well as carried out at lower temperatures or without the aid of pressure. Long and costly research has rewarded the rubber manufacturer with a number of organic chemical compounds called "accelerators" which have very remarkable powers of affecting the complex reactions of hardening rubber as well as the characteristics of the resulting product. One of these, called by the chemist "thiocarbanilide," is a white, pearly, crystalline solid, which may be made by the simple process of allowing equal volumes of aniline oil and carbon bisulfide to stand overnight. Another is the well known kidney medicant, "urotropin," known to the chemist by the long name of "hexamethylenetetraamine." It is made by the combination of formaldehyde with ammonia. Still other accelerators are diphenylguanidine ethylideneaniline and paranitrosodiethylaniline.

(*Concluded in December issue.*)

RADIO JINGLES

IMPROVING RECEPTION

She calls toroids and spiderwebs "flivvers;"
She's tried copper and brass and tinfoil;
And, say, can you beat her?
She says music's sweeter
When it comes through a

—Helen Peters.

SHE LACKED SELECTIVITY

A terrible flirt was Sal Sickler—
She kept getting fickler and fickler;
If you asked her to wed,
She generally said,
"Sure thing! I ain't one bit par-

—Norris E. Wilson.

OBEYING THAT IMPULSE

From my speaker, a speaker still spoke.
While I longed just to give him one poke.
So I just turned the dial,
For something worth while,
And finished him off with a

—Ralph D. James.

SHIELDED INTERFERENCE

"Ah! Caught red-handed!" said the cop,
"You come along with me."
"This is my house," replied the man,
"But I have lost my—

."

—Herbert Scott.

HOW DOES AN ELECTRON FEEL?

A Jersey girl loved a big Rube;
She went out to ride with the boob,
They ran out of gas
And the poor little lass
Got most of her ride in the

—Norris E. Wilson.

THE CYNOSURE (ACCENT ON THE "SURE")

"O, is he a hero or what?
Or is he a statesman fiery?"
"My dear, not so,
That big gazabo
Is an

!"

—Helen Peters.

EQUINE-FREQUENCY LOSSES

At the races a fellow named Clug
Far down in his pants-pockets dug;
Bet two grand on one horse
And got naught but remorse,
For he lost all his *on the*

—Marvin Deerhake.

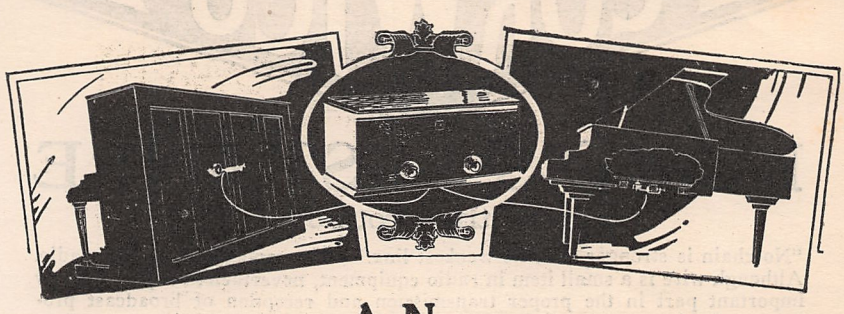
REGULATION IS ESSENTIAL

The jingler coins his leisure time
For DX dollars sweeter:
But while he puzzles out his rhyme
He well must watch his *!*

—Jingle Editor.

RADIO NEWS will pay $1.00 for every 4- or 5-line stanza accepted and printed here. Send all contributions to Editor, Radio Jingles, in care of RADIO NEWS.

Makes any Piano a Marvelous Radio Loud Speaker

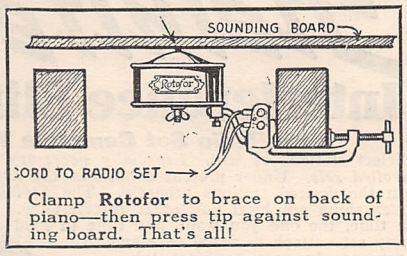


A New Invention that Reproduces Every Note in the Musical Scale Perfectly

NOW you can hear all the tones in radio! Low tones—high tones—tones that can't be heard on ordinary loud speakers—come in loud and clear on the new Rotofor "Piano Speaker."

A NEW PRINCIPLE

Everyone knows that the big wooden piano sounding board is the finest musical sound reproducer known. Yet other speakers have used metal, paper or composition horns. **Rotofor** is the first to utilize wooden sounding board—and bring a new thrill to radio! You hear everything that's broadcasted! No more harsh, tinny reproduction or objectionable barrel tones, common to cone speakers. Every note clear and mellow.



Clamp **Rotofor** to brace on back of piano—then press tip against sounding board. That's all!

DOES NOT INTERFERE WITH PIANO

You can attach the **Rotofor** instantly to your piano—plug the other end of cord in radio—and that's all. No interference with either instrument.

NO MORE UGLY HORNS!

Rotofor is known as the "INVISIBLE SPEAKER" because it is the first to do away with the unsightly horn. **Rotofor** is out of sight on the back of your piano.

Compare the **Rotofor** in your home with any other speaker. Although **Rotofor** costs only $28.00 it will give you clearer reproduction—less static—and bring in notes that can't be heard on ordinary speakers.

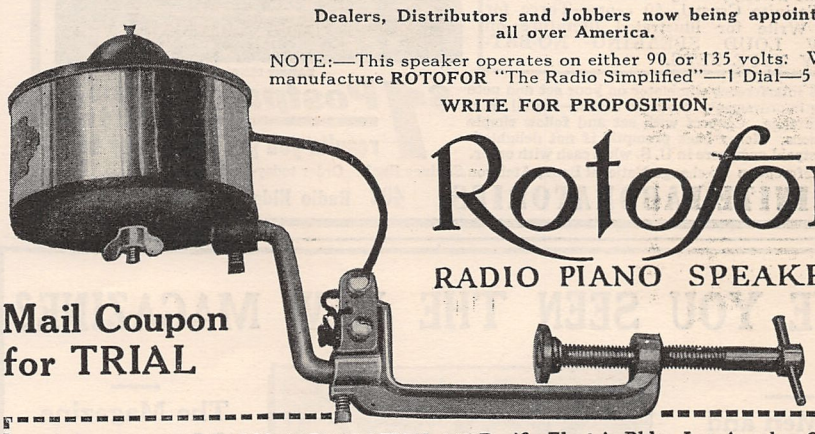
SOLD ON MONEY BACK GUARANTEE

Ask your radio dealer for a demonstration in your home—or mail coupon below marking which offer you prefer. Satisfaction guaranteed or money back after 10 days' trial.

Dealers, Distributors and Jobbers now being appointed all over America.

NOTE:—This speaker operates on either 90 or 135 volts. We also manufacture **ROTOFOR** "The Radio Simplified"—1 Dial—5 Tubes.

WRITE FOR PROPOSITION.



Rotofor
RADIO PIANO SPEAKER

Mail Coupon for TRIAL

INTERNATIONAL RADIO CORPORATION, 145 Pacific Electric Bldg., Los Angeles, California. or 225 W. Ohio Street, Chicago, Illinois.

( ) I enclose $28.00. Send me a **Rotofor Piano Speaker** prepaid.
( ) Send a **Rotofor Piano** C. O. D. for 10 days' trial—money back if I'm dissatisfied.
( ) Send a **Rotofor Piano** to my dealer to deliver to me.
( ) Send me more information about the Rotofor Piano Speaker.
( ) Send me information about **Rotofor**—**"The Radio Simplified"**—one dial—5 tubes.

Name ..... Address .....
City ..... State .....
Dealer's Name ..... Address .....

CORWICO

RADIO'S BEST WIRE

"From the Ground Up"

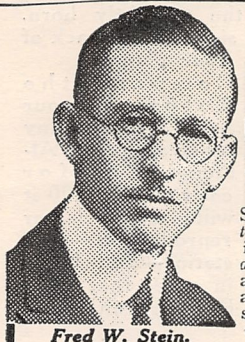
"No chain is stronger than its weakest link." The same holds true in radio. Although wire is a small item in radio equipment, nevertheless it plays a very important part in the proper transmission and reception of broadcast programs. Look to your aerial, your connections, your ground wires, etc. Perhaps they need replacing. For whatever purpose you might need it, there is a Corwico wire that will serve you best and last the longest. Ask your dealer for Corwico wire.

FREE Write for interesting booklet, telling all about the various kinds of radio wire and their uses.

Dealers and Jobbers—Write for the "Corwico" wire proposition.

CORNISH WIRE COMPANY

30 Church Street New York City



Fred W. Stein.

Steinite

Greatest $1 Value in Radio Today

Interference Eliminator

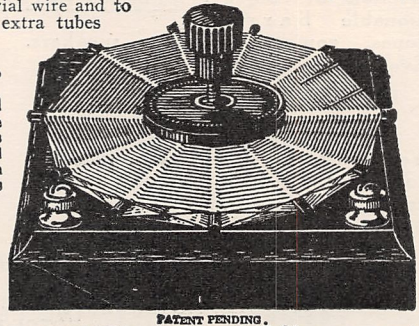
No Radio Set Complete Without It

Select stations at will. *Especially necessary for 1 and 2 dial controlled sets.* Under present conditions the average set fails to bring in the desired stations properly. The *Steinite Interference Eliminator* shuts out local and other interference. You get one station at a time, the one you want, and tune in loud and clear. Operates on any set—attach to aerial wire and to set—no changes—no extra tubes or batteries.

Over 400,000 Sold

Improved Results With Tube or Crystal Try entirely at my risk the wonderful improvement this inexpensive little device will make in the reception of your set. Improves results on both crystal and tube sets that use any kind of aerial except loop antenna. Clears up reception wonderfully, increases volume, and partially absorbs static. ***MONEY-BACK GUARANTEE.***

Mfrs. famous Arieliminator, $1 (replaces outside aerial); Long Distance Crystal Set $6; Steinite Crystal, 50 cents—Three for $1. Write for illustrated literature on NEW LOUD SPEAKING NO-BATTERY TYPE SETS.



PATENT PENDING.

Put this interference eliminator on your set and note amazing improvement. No tools needed—install in a moments time. Connect with set and follow simple instructions. Money back promptly if not delighted. $1.00 postpaid anywhere in U. S. when cash with order.

$1 Postpaid If you are not delighted with results you get your dollar back

References: Exchange National Bank, Atchison Savings Bank. Order today—a dollar bill will do.

STEINITE LABORATORIES, 402 Radio Bldg., ATCHISON, KANSAS

HAVE YOU SEEN THE NEW MAGAZINE?

For Men and Women who want to become Independent

MONEY MAKING

The Magazine of Opportunities

Earn a Second Income

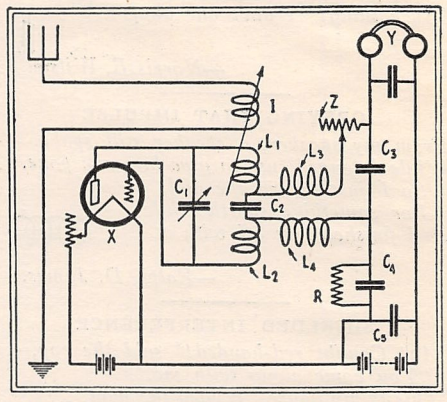
25c ON ALL NEWSSTANDS

Progress in Radio

(*Continued from page* 509)

provides sufficient capacity. In this case the tuning might be effected by varying the inductance of the coils L1 and L2. The condenser C2 is of large capacity compared with the condenser C1.

The condenser C2, coils L3, L4 and condenser C3, form a circuit tuned to a frequency lower than the frequency of the incoming signal. Subsequently in the specification this frequency is referred to as the "quenching" frequency. Connected to this circuit is a high resistance R, shunted by a



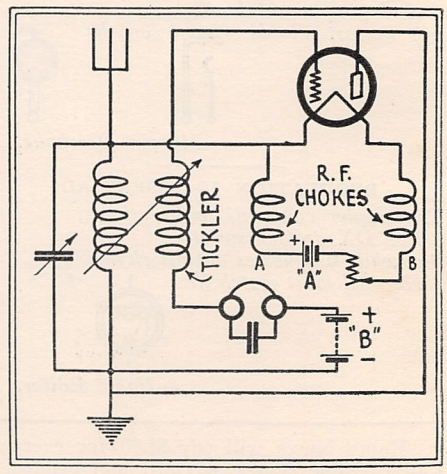
A single tube Super-regenerative circuit of considerable merit.

condenser C4 and connected to a blocking condenser C5. In series with the "B" battery the headphones Y are connected. The "quenching" frequency of this circuit may be sub-audible, audible, or R.F., provided that this frequency is greater than that I.C.W. transmission when this form of transmission is used. It is claimed that a circuit in accordance with this invention requires few adjustments of a non-critical nature to obtain great amplification. (British patent 253,192). —*Wireless World.*

THE FILADYNE CIRCUIT

One is inclined to connect the grid of a tube to the input circuit, hardly ever to employ the plate as the input side, as is done at times; but who ever before thought of utilizing the filament?

An English amateur did this in an attempt to reduce the effects of the space charge within a tube and met with startling results. The circuit, with regeneration used, is shown; it will be noted that the aerial circuit con-



The Filadyne circuit—the input is to the filament, the plate is at ground potential and the "B" battery is in the grid circuit—but it works!

nects directly to the filament, that the "B+" is connected to the grid and that the plate of the tube is at ground potential. An odd state of affairs, yet it works; and quite well at that, providing the two radio-frequency chokes A and B are employed. Without them the radio-frequency currents have a low resistance path to ground. Each of these chokes consists of 250 turns of No. 24 DCC wire.

There is no saying what the specific action of the tube is under these rather curious circumstances, but it is not believed that the input voltage has any marked effect, if any, on the electron emission of the filament. Only certain types of tubes work well in this circuit.

Cheer for the Shut-Ins

(*Continued from page* 473)

save the home for the children by giving her some regular financial help and friendly assistance in steering the youngsters the way they should go.

How to keep Andy safely occupied and out of mischief is a real problem. A radio may solve it and save Andy from the tragedy of becoming an institution child. Radio has helped to stabilize many a youngster before.

Case No. 3

Joe R. is a helpless victim of heart trouble.

A few years ago he had built up a fine little business as bootblack in the lobby of a big office building. He is a very little man with a very big stutter and the combination made him the butt of many jokes; but with a good job, a devoted wife, and three brown-eyed babies, life seemed good to Joe.

Then heart trouble developed like a bolt from the blue sky. He had to give up boot blacking and try lighter work. One heart attack followed another until he is so weak that there seems little chance of his ever being able to work again. He may live for a long time. His savings are all gone; he lies helplessly in bed most of the time.

Mrs. Joe and Maria, their eleven-year-old daughter never leave him alone. The wife is worn by the long strain. She is very thin and tired; but Maria and her two little brothers are growing up well and strong. Some kind friends have been sending money to the *Charity Organization Society* which has made it possible to keep the home together. A radio would be a wonderful joy for Joe this winter and would bring to his bedside the world from which he is so completely cut off by his illness.

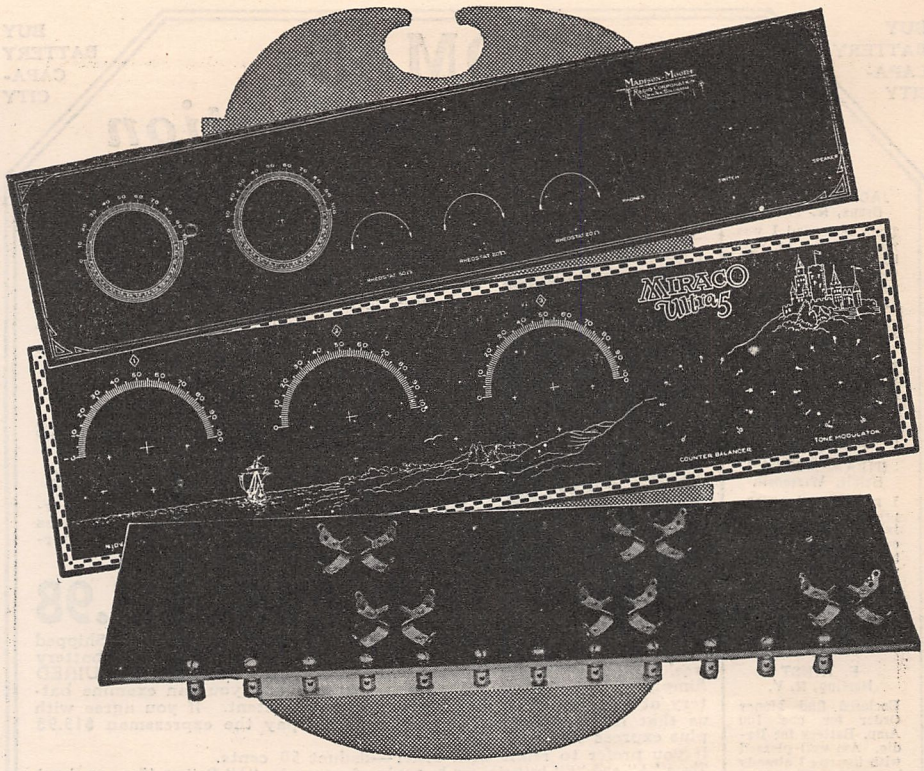
Case No. 4

Mrs. K., a young widow, with one little girl, suddenly discovered that she had tuberculosis. Immediate sanitarium care was necessary, and she went away leaving her little girl, Anna, nine years old, with an aunt and uncle.

Mrs. K.'s progress in the sanitarium has been slow but satisfactory.

Because of her condition now, she is unable to sew or read for very long at a time and is allowed no recreation which calls for exertion. She is a "bed patient," as they say, and the days are long and sometimes dreary. She is brave and eager to get well and never is discontented or complains of her lot.

A pair of earphones which she could use in the sanitarium in connection with its central radio receiver, would be a source of much happiness to her.



Complete Radio Service

From FORMICA

FORMICA'S SERVICE for the radio manufacturer this year includes front panels Veri Chromed in one and two colors; punched and drilled sub panels; sub panels with contacts riveted on, and binding posts assembled; small insulating parts, and tubes for coils.

There is ample equipment for all of this work available and many of the largest volume producers are already being served.

FORMICA FOR THE AMATEUR

Formica Panels Veri Chromed in gold on high gloss Formica are available for the leading kits and are supplied to amateurs who assemble their own sets by dealers and jobbers. The panels now available are Bremer Tully Counterphase; Browning Drake National; General Radio Four Tube Universal; LC 26 Cockaday; Victoreen Superheterodyne; Best's Superheterodyne; Madison Moore Superheterodyne; Camfield Duoformer; Aerodyne 5 Tube; St. James 8 Tube, Karas Equamatic front and sub panels. Infradyne 7 x 30 and 7 x 28.

Standard Formica Panels of most popular sizes are carried in stock by leading dealers—each one in a neat individual envelope.

THE FORMICA INSULATION CO.
4618 Spring Grove Avenue Cincinnati, Ohio

FORMICA
Made from Anhydrous Bakelite Resins
SHEETS TUBES RODS

APPROVED RADIO NEWS LABORATORIES 1922

BUY BATTERY CAPA-CITY

THOMAS Battery Combination

BUY BATTERY CAPA-CITY

JACK SAGINARIO
Bronx, N. Y. City
I am very glad I was recommended to your battery as I get twice the volume. I will always recommend it to my friends.

JULIUS R. BROWN
New York City
I have used Thomas Batteries for twenty-two months and will always recommend it to the next person as being the "goods."

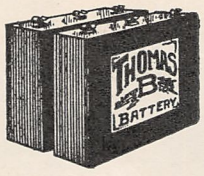
HIRAM MORGAN
Beloit, Wisconsin
I guess the best appreciation I can show is to enclose check for one of your 100 Amp. hour batteries as advertised in the Radio Magazine. The one I got some time ago from you is Perfect and giving excellent continuous service.

E. AINST
Horling, N. Y.
Enclosed find Money Order for one 100 Amp. Battery for Radio. Am well pleased with the one I already have and want another just like it.

THIS "A" BATTERY

100 Ampere hour "A" Battery at standard rate. 6-Volt capacity absolutely guaranteed—Will operate the Average 5 tube set for a month or more on a single charge. Solid rubber compartment case, lead coated carrying handle. Non-corrosive terminals. Built of the finest materials by the most modern methods.

GUARANTEED 2 YEARS
OVER 18,000 SATISFIED CUSTOMERS



AND THESE "B" BATTERIES

Standard, solid, high power, maximum service, full 45-Volt: "B" batteries. Seamless cells. Built of only the best "B" battery materials. None better at any price.

ALL FOR $13.98

Manufactured under the supervision of Battery experts—Shipped direct from the factory to you—promptly, No delays—Every battery fresh and new. NO DEPOSIT OR ADVANCE PAYMENT REQUIRED Simply order—and we will ship by express and you can examine battery at your express office to your heart's content. If you agree with us that it's the biggest offer ever made—pay the expressman $13.98 plus express charges.

If you prefer to remit with order—deduct 50 cents.

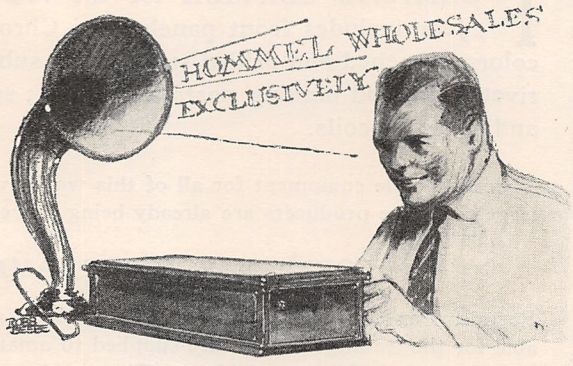
These "A" and "B" batteries can be purchased separately. "A" Battery (Same as above) $10.50. "B" Battery (Same as above) $2.50 each.

All prices quoted are for Domestic Shipments only—Export price 15 percent additional. Remit with order U. S. currency or equivalent. Prices on other sizes and auto batteries on request.

THOMAS BATTERY CORP.,
507 West 50th St., N. Y. City
Gentlemen: I am enclosing $..... for ☐ "A" Batteries ☐ "B" Batteries as advertised in RADIO NEWS.

NAME .....
ADDRESS .....
CITY ..... STATE.....

A Hookup for Dealers that Eliminates Interference



When a Radio Dealer "hooks up" with the House of Hommel—he is assured of the closest co-operation and of a dealer service unexcelled, if even equaled, by any other radio jobber—all of which means greater profits for Hommel Dealers.

The numerous user inquiries referred to their dealers—their policy of wholesaling only—the large stocks of reputable radio equipment carried at all times for immediate shipment to dealers—their inspection and repair department—their modern display room—are but a few of the many features of Hommel Service that are responsible for the reputation and success of the Hommel organization today.

Hook up with Hommel—the helpful jobber—you will find Hommel's Catalog 566-S invaluable in ordering and dealing with your customers—write today.

WHOLESALE LUDWIG HOMMEL & CO EXCLUSIVELY
929 PENN AVENUE — HOMMEL — PITTSBURGH, PA.

A RADIO EDUCATION---IN 5 VOLUMES

THEORY, DESIGN, CONSTRUCTION, OPERATION & MAINTENANCE—LEARN AT HOME

These five component parts of a complete Radio Instruction Course are outlined in five volumes that contain not merely the essentials as so many books do, but more, they contain all that any modern up-to-the-minute textbook on any subject would cover. They are in themselves a COMPLETE radio education, teaching every possible portion of Radio science. Size of each book 6 by 9 inches, handsomely bound and illustrated with charts, diagrams, descriptions of equipment, etc.

SEND NO MONEY for these books. Just forward your name and address and mention you wish "the Radio Reading Course". We send you the books at once. On receipt of same you pay the postman $1.97 plus a few cents postage and then they are yours.

THE CONSRAD CO., Inc. 64 Church St., New York, N. Y.

Case No. 5

Paul M., a cripple, 25 years old, is the eldest of eight living children. His mother is a widow, and since the father's death has kept the home together with the help given by the C. O. S. Paul is a hopeless invalid, and has been for seven years. He lies in bed at home unable to see or move about except when lifted. His mind, however, is keen, and he thoroughly enjoys entertainment as well as the friendliness of the neighbors. The latter drop in daily for short visits to discuss the weather, politics, and to swap gossips and jokes. Paul never forgets anything you tell him, and the few minutes spent by his bedside are full of interest and enjoyment for the visitor. His next oldest brother, Albert, is fast becoming incapacitated by the same trouble; a progressive paralysis for which the doctor can find no cure. A year ago Paul received a present of an old phonograph which is now broken down and cannot be mended.

A radio is the height of his ambition, and would give him and Albert extreme pleasure.

Case No. 6

Mrs. A., is working hard in a factory to support her sick husband and baby girl. The husband is slowly dying of pernicious anaemia. He may live several months; and she is trying desperately to keep the home together for him and the baby.

He loves music, and a radio set would be a great joy to them all. It would be a wonderful comfort to Mrs. A. to feel that he has something to amuse him while she is away at work.

Case No. 7

There are three people who would enjoy a radio together in the D. family—Father D. has serious heart trouble, Mother D. has rheumatism, and Rosina D. is a delicate child of ten.

The father and mother almost never get out, and the *Charity Organization Society* is keeping the home together. A radio set would be a great source of amusement to the two invalids; and of course Rosina would love it.

Case No. 8

Salvadore 14, Joe 11, and Theodore 8, are the three sons of a man who has been in the State Hospital for the Insane for five years. They are fine, strong children and devoted to their mother, who works hard to keep the home together for them; but the shadow of their father's condition hangs over them all the time and they all tend to brood over the situation.

The doctors feel that there is no reason why the children should ever develop trouble like their father's, if they can live a normal life now and have plenty of outside interests. They want a radio very much, and it would seem a very good means of keeping their minds occupied with a healthy interest.

In addition to the small sum which the mother earns, the *Charity Organization Society* is giving a regular allowance to this family, but it covers only the necessities and leaves little margin for amusements.

Case No. 9

Tony, a young, ambitious automobile mechanic, was the pride of his parents, their only child, and their safeguard against a dependent old age. Now at the age of twenty-two he is a chronic invalid, crippled by arthritis. He has made a valiant fight, struggling against despondency, hiding his suffering from his elderly parents, and always hoping to recover. Last spring he was walking a little with the aid of a cane, but now he is forced to sit all day in his chair by a tenement window, looking out upon a drab, poverty-stricken street. Because of

the pain and the swelling, he cannot use his hands, and he cannot read much; so he just sits by the window all day long.

Twice a week Tony crawls painfully down the steep stairs into an automobile, drives to a nearby clinic for treatment and then home again, where the friendly chauffeur helps him up the stairs.

The *Charity Organization Society* is seeing to it that Tony and his elderly parents have enough to keep their home together. But his days are long and full of suffering, and he needs something to amuse him as well as food and shelter and medicine.

Being a son of Italy, Tony loves music. A hurdy-gurdy passing his window brightens the whole day for him. Has anybody a radio which they would like to give to Tony?

Case No. 10

Cancer is making the end of his life one long agony for Thomas D. He is a gentle old man, nearly seventy. In his younger days he was a goldsmith and jewelry designer and held good positions; but it is long since he has been able to work, and all his savings are gone. His wife, a gentle, white-haired, little lady, attends him like a child. They are all alone in the world with no children and no relatives, but in the poor neighborhood where they live, they are respected and loved by all. Mrs. A. across the hall runs in with a dish to tempt the old man's appetite every day. Another neighbor helps pay the rent. In fact, for a little while the neighbors supported them almost entirely; but this could not go on, and now the *Charity Organization Society* is giving them a weekly allowance to take care of their needs. Would one of the readers of RADIO NEWS like to give a radio set to this old couple, to brighten their days during the coming winter?

Case No. 11

Captain R. is now 79 years old and has been too feeble to do any kind of work for the past five years. He spends his time reading and looking out of the window of his apartment to the court below. He is very much interested in the news of the day and is always wishing that he were able to resume his former active life. His history is an interesting one; as he is an old New Englander whose brothers, and father and grandfather before him have all followed the sea. He himself was a tugboat captain and pilot on the waters of New York Harbor for about 50 years. In his younger days he was also an excellent singer and is still very fond of music. Mrs. R., who is 70 years old, is now unable to do any work outside of taking care of the rooms which the couple occupy; and she cannot read because of trouble with her eyes. Both are practically confined to their rooms most of the time, as they have very few friends or relatives to visit them. Both Mr. and Mrs. R. would thoroughly enjoy having a radio set, as it would put them directly in touch with the outside world. It would make a fine birthday gift to Captain R. for his eightieth birthday which, he admits, is "almost here."

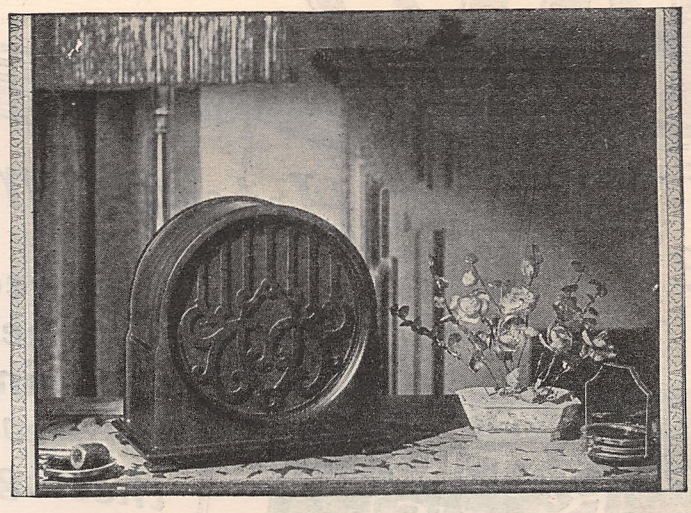
THEY FELT LIKE AN OMELET

When Cholly and his room mate awoke at 11 A. M. they were still feeling the effects of a little incident of the night before. Reaching across the bandaged head of his companion, Cholly threw in the radio switch. A famous hotel chef was giving his daily talk:

"—and then I beat up a couple of fresh eggs."

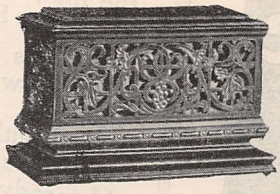
"Zat's zat cop over to stashion!" declared Cholly. "He's spillin' us to the sergeant."

—Contributed by William H. Spaulding.

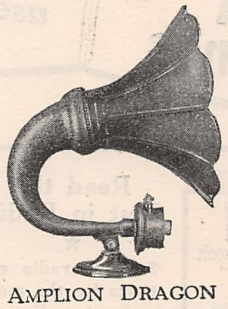


Artistically, this new Amplion Cabinet Cone graces the most exquisitely appointed drawing room—acoustically, it sets a new standard in radio reception.
AC12 . . . . $30

HERALDING— a New Radio Voice



AMPLION PATRICIAN
A new model of the air column type—as pleasing to the eye as to the musical ear. Non-directional general diffusion of sound. 48-inch air column in an 18″x12″x9″ cabinet.
AA18 . . . . $45.00



AMPLION DRAGON
The world's "best seller"—adopted as the standard among leading radio engineers for experimental and comparative tests. Famous for its sensitivity to speech and musical signals, and for volume without distortion.
AR19 . . . $42.50

When genius sings or speaks or plays—a breathless silence follows.

When the new Amplion Cone reproduces vocal or instrumental tones — an awed hush ensues.

For this new type of cone, designed by the engineering genius of the world's largest makers of sound reproducing devices, sets an entirely new standard in radio reception.

A precision of sound-values—a mellow clarity—an utter absence of distortion or "chattering"—characterize the new Amplion.

Built on an entirely new principle of *balanced* construction and exceptionally responsive to the weakest signals, the new Amplion reproduces the entire vocal and musical range with an astonishing purity, combined with the utmost volume.

Sensitive as a deer to the faintest sounds, this Amplion sets a new standard of reception for every set. It is the last link in the chain of quality broadcasting.

As you listen in — to classical music or jazz — to symphony concert or brass band—to speakers or singers — it becomes increasingly difficult to tell the difference between the actual performance and *the new radio voice!*

Write for the interesting Amplion Booklet

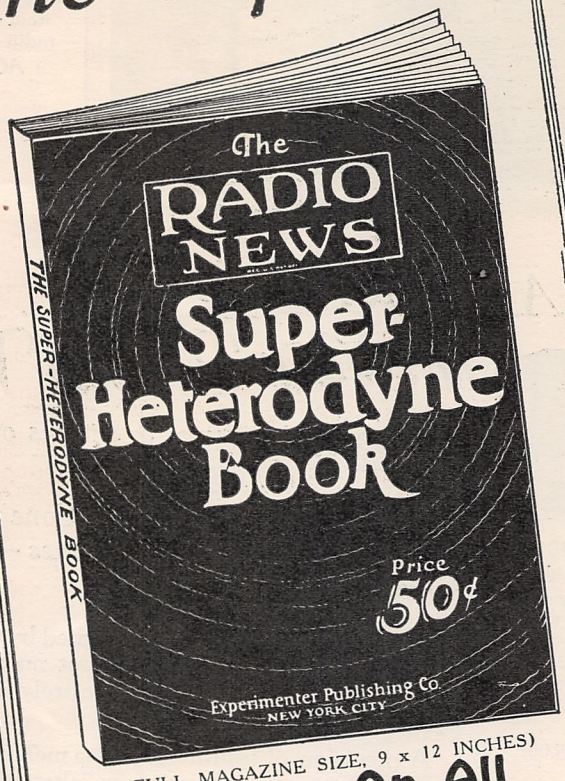
AMPLION

THE AMPLION CORPORATION OF AMERICA
Suite S 280 Madison Avenue, New York City
THE AMPLION CORPORATION OF CANADA, Ltd., Toronto
"The House of Graham" is known throughout the world, through its associated companies

From 1887 . . . . . A Path of Brilliant Achievement . . . . . to 1927

NEW!

The Super-Heterodyne Book



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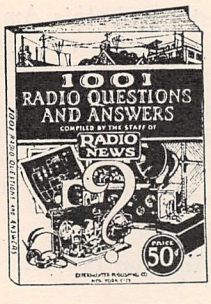
The greatest book of superheterodyne circuits, information and data ever compiled on these great receivers

Now!—a veritable encyclopedia on ALL existing forms of superheterodynes, giving the step-by-step advancement from the first, early hookups to the very latest and finest Super-Receivers of today.

All kinds of wiring diagrams on all the well known Supers. Notes on advanced hookups and constructional improvements with drawings. Valuable information including all patents covering Super-Heterodynes.

Information and data without end. Just the book for every man who owns a super or who wants to install or construct one of these powerful sets.

Get your copy today--from any radio or newsdealer, or use the special coupon below.



Contains 116 pages, 300 illustrations and is published in the large Magazine Size 9 x 12 inches

Meet Your Radio Problems and Beat Them

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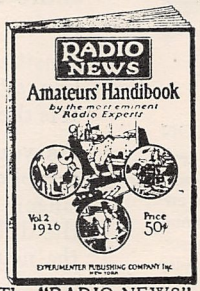

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An Autobalanced Receiver

(*Continued from page* 498)

on the baseboard after the panel is assembled to it, so that their correct relation to the primary coils L on the condenser shafts can be determined.

A rear view of the panel is shown in Fig. 3, illustrating more clearly the battery-cable plug and the alignment of the R.F. coils and condensers.

Fig. 4 is a view of the under side of the baseboard. All of the wiring, except those connections which run up through holes in the baseboard to the condensers and coils, is shown. Note the type of sockets, S, used; that for the detector, S1, is mounted on springs to reduce vibration of the tube with the resultant loud-speaker hum.

WIRING THE SET

Now that the parts are all assembled on the panel and baseboard, let us see what is necessary to wire the set. Before starting, study over Figs. 5, 6, and 7. Referring to Fig. 5, the schematic diagram, all the parts are seen marked with symbols to correspond with those of the other illustrations, so there is little chance of going wrong.

Now is a good time to talk about that 2-ohm filament rheostat mounted on the panel and indicated in Figs. 1, 2, and 5 as R. This rheostat is in the "A—" battery lead and controls the current of all of the tubes. But in addition, we have three more filament rheostats, R1, R2 and R1; one controls the filament current of the two R.F. tubes, another the filaments of the two A.F. tubes, and the remaining one, R2, the filament of the detector tube V2. Now assuming that the rheostat R is not in the circuit, we can adjust the three rheostats in the rear once and for all to their proper value. But suppose the battery voltage drops, as it usually does when discharging, how can we compensate for it? We could not without R in the circuit. With R set about half way in, the other rheostats, R1 and R2 can be permanently set; and we have plenty of leeway in R to compensate for changes in the battery voltage. In addition it acts as a volume control. This is the first time we have shown this feature in a set, and it is to be highly recommended to set builders.

By carefully following the wiring plans of Figs. 6 and 7 you will have little difficulty with the set. Those wires of Fig. 7 which pass through holes in the baseboard, and connect to the instruments above, are numbered to correspond with the numbering of the wires from the instruments themselves as shown in Fig. 6. Spaghetti-covered busbar wire should be used throughout.

OPERATION

The design of this set is such that a power tube, such as the 112 or 171 type, may be used in the last stage at V3 if desired. A separate "C" battery connection for it is provided in the battery cable, which by the way has seven wires. After the set is wired, batteries, aerial, etc., connected, it may be placed in operation.

If care was taken in the wiring, the set will work more or less as it is without further adjustment; but for maximum operation and efficiency, the correct coupling angles of the R.F. coils must be determined. This requires a little care. They must be placed so that the set does not oscillate at the lower settings and also works well on the higher.

You will find that in order to prevent oscillations the secondaries will have to be moved to a considerable distance from the primaries. The coupling between the aerial coil and the secondary, in the first R.F. transformer, is not so critical.

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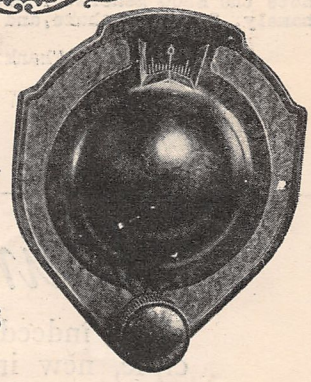

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When it comes to dx ESCO sure is the berries. The information on filters that you gave me several months ago,was highly acceptable,and no doubt accounts for some of my good dx this summer.

My signals have been heard and worked in every part of the globe in the last two months of summer and I credit it all to the keen note the ESCO generator puts out. My filter system is what you suggested, namely, 30 henry choke,and 6 mfd condensers.

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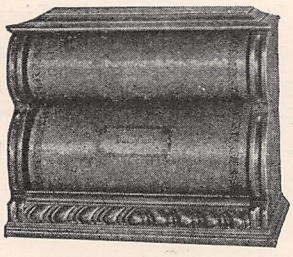

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Transformer-Coupled Amplifiers

(*Continued from page* 511)

THE FLUXES

Now, in every transformer, it is the *magnetic flux,* which is established by the current flowing in the primary and which threads the secondary winding, that induces the electromotive force in the secondary. But not all of this flux is utilized in thus producing the secondary e.m.f. Part of the flux set up by the primary current does not thread the secondary winding; this is known as the "primary leakage flux." Likewise, since the secondary winding derives its energy from the energy in the primary, it is the reaction of the secondary, which determines how much energy the primary draws from the source V_1 in Fig. 4A.

In other words, the induced secondary e.m.f. establishes a secondary current, which sets up a flux threading back through the primary windings. As with the primary leakage flux, all of this secondary reacting flux does not thread the primary winding; and this part of the secondary flux is known as the secondary leakage flux. To sum up then, that part of the primary flux which threads both windings is the useful part of the flux and is known as the "mutual flux"; it is reacted upon by part of the secondary flux. That part of either the primary or secondary fluxes, which does not link both windings, but threads only that winding in which it is generated, is the leakage flux. It is the relation between the mutual flux and the total fluxes which determines the *degree of coupling* in the transformer. (This principle applies to radio-frequency transformers as well).

It is well to know that these leakage fluxes exist, although it is difficult to apply this knowledge analytically in the design of transformers. The leakage flux, in every case, will lower the voltage ratio of the transformer and make it act less efficiently.

To simplify the explanation, we will assume that our transformer has no leakage flux; in other words, that it is a perfect transformer, and that all the energy fed into the primary goes into the secondary via the mutual flux. In that case when the transformer works into an *open circuit* (that is, when the resistance load connected to the secondary has infinite impedance so that there is no *current* in the secondary circuit) the voltage ratio is equal to the turns ratio of the transformer. This is the simplest case.

THE PRIMARY IMPEDANCE

Another thing which interests us considerably is the *primary impedance* of the transformer; that is, the impedance which it presents to the impressed alternating voltage V_1 in Fig. 4A. In voltage amplifiers, which are generally used in radio receivers, it is required that this be as high as possible; in order that the greatest part of the total voltage V_1 be expended *in the transformer* and not in the resistance r_p. On the other hand there are limitations to the application of this principle which are determined by size of transformer, cost, etc. The question of faithful reproduction also depends upon the magnitude of the primary impedance; the greater the inductance of the primary the better will be the amplification of the low frequencies. More of this later.

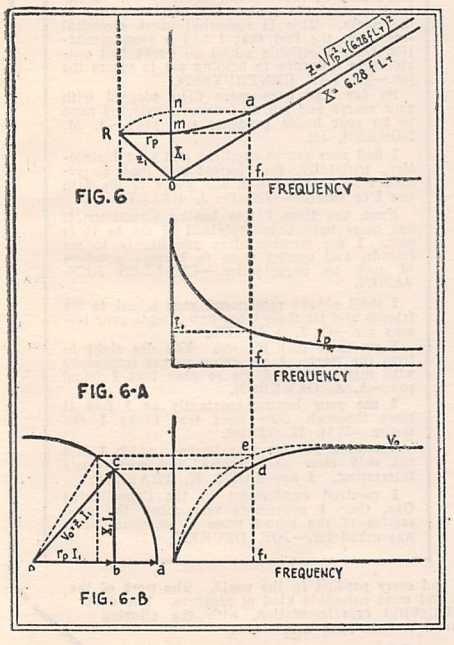
In the theoretical perfect transformer the primary impedance is entirely due to the mu-

tual inductance and is equivalent in ohms to $6.28ufM$, in which u is the ratio of the primary turns to the secondary turns, f is the frequency, and M is the mutual inductance in henries. Thus, in a 3-to-1 transformer, having a mutual inductance of 20 henries, the primary impedance at 1,000 cycles is $6.28 \times 1{,}000 \times 20 \times \frac{1}{3}$, or about 42,000 ohms. When the transformer windings have resistance, as must be true in practice, the impedance is increased somewhat; although generally this change of impedance due to the resistance is negligible in amplifier transformers.

It is advantageous to have the primary impedance of the transformer as high as possible for two reasons; first, this prevents the voltage applied to the transformer primary terminals from dropping too low and thus impairing the amplification at low frequencies; and, secondly, the high impedance tends also to straighten out the *characteristic* of the tube to which the transformer is connected. This effect is negligible in comparison with the former, so we will defer discussing it, and consider the former in detail.

FORMULAE OF THE INTERACTIONS

Let us look at Fig. 5. The primary circuit of the transformer is essentially an e.m.f. V_o in series with a resistance r_p and an inductance L_t. We will neglect, as before, the resistance of the transformer, as its effect is generally negligible. The primary impedance of the transformer will then be the *reactance;* which is equal to $6.28fL_t$, in which L_t is in henries.



These theoretical curves give an excellent graphical representation of the theory of transformer coupling.

Now, the total voltage generated in the plate circuit is V_o, which is the same as μe_g (μ is the voltage-amplification constant of the tube and e_g the input on the grid). This voltage is divided into two parts: viz., that part which appears as a voltage drop in the plate resistance, r_p, and the remainder, which is the *useful* part, and which is impressed on the primary terminals of the transformer. The former is designated as V_{rp} and the latter as V_t in Fig. 5.

The voltage drop in either the resistance or the reactance is equal to the resistance or reactance multiplied by the current. Thus, if I_p is the current, the voltage drop in the resistance is r_pI_p and that in the reactance is $6.28fL_tI_p$. (I_p is in amperes). Since r_p and L_t are in series, both carry the same current; and it follows that the voltage

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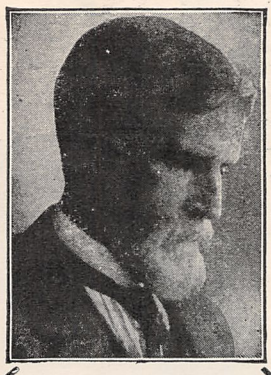

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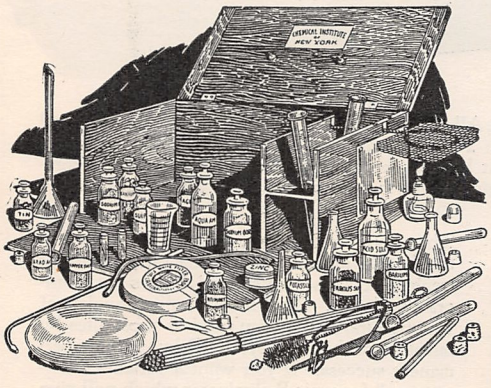

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drops in the two are proportional to their impedances.

This is not important at the present, but it indicates that in order to have a large part of the total voltage drop appear across the terminals of the transformer, L_t must be large.

A GRAPHICAL SOLUTION

This whole discussion may seem complicated at first, just as the figure which we are about to describe, but once understood, the simplicity of it all will be apparent. In connection with Fig. 6, the following ideas must be borne in mind:

(1) The *reactance of the transformer is dependent upon the frequency* and is equal to $6.28fL_t$.

(2) The impedance of a series circuit, such as we are studying, is the square root of the sum of the squares of the resistance and the reactance, or, $\sqrt{r_p^2 + (6.28fL)^2}$. This is the same formula which gives the hypotenuse of a right triangle whose sides are respectively equal in length to the values of the resistance and the reactance. For this reason in Fig. 6, instead of computing the total impedance of the plate circuit, we obtain it graphically by constructing right-angled triangles.

(3) Assuming the alternating voltage applied to the grid of the tube preceding the transformer to be constant, then the voltage V_o developed in the plate circuit will be constant, and the current in the plate circuit, or I_p, will be this voltage divided by the total impedance of the circuit.

(4) The voltage drop in the resistance is r_pI_p, and that across the terminals of the transformer is X_tI_t; where X represents the reactance of the transformer (and is equal to $6.28fL_t$).

Now to study Fig. 6: at the upper right we have a diagram showing the frequency f on the horizontal axis, and the reactance, X_t on the vertical axis. (The straight line drawn on the graph shows the manner in which the reactance varies with the frequency; it is straight for the reason that the reactance is proportional to the frequency, that is, if the frequency is double the reactance is double, etc.)

Now, at any given frequency, as at f_1, the reactance is X_1. Using this value as the line Om in the figure, the altitude of a right triangle, we can lay off at right angles to it the line mR, the length of which represents the resistance r_p. The length of the hypotenuse of this triangle, or the line OR, represents the total impedance of the plate circuit, and is marked Z_1. Then, taking a pair of compasses, from the center O, measure OR on the axis of X_t, as indicated by the broken arc, giving the line On. Then (moving horizontally over the dotted line, from the point n to the vertical line drawn through f_1) we obtain the point a, the height of which above the axis of frequency Of_1 is the total impedance Z_1 at the particular frequency. If this sounds complicated, go back and read this paragraph again. It will very soon become clear enough.

If we follow this procedure for many points on the axis of frequency, we shall obtain the curve marked Z, which shows how the total impedance of the plate circuit varies with the frequency. It will be noted that at very low frequencies, the total impedance differs considerably from the transformer reactance, but as the frequency increases they become more and more nearly equal.

EFFECT OF CHANGE IN FREQUENCY

This means that at low frequencies the resistance of the plate, r_p, has a predominating influence on the impedance of the circuit; whereas at higher frequencies its influence is less, the reactance contributing the greater part of the total impedance.

Now we will go a step farther. We have assumed that the voltage developed in the

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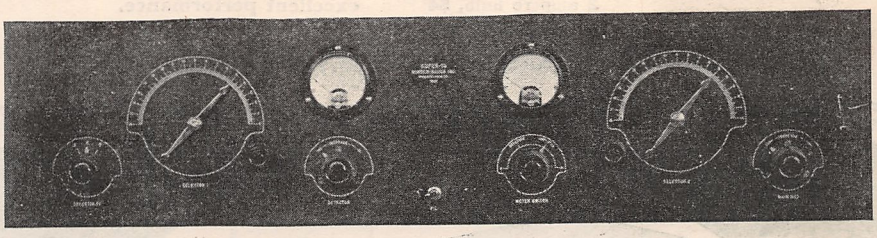

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—Wide wave length range without change of coils, etc. (Adaptable 35 meters to 3600 meters if desired.)
—Use Loop or Antenna.
—Simple to operate, having only two major tuning controls.
—No Harmonics. Signals are received only at one point.
—Special Power Audio Amplifier, operating any loudspeaker and eliminates necessity of external amplifier.
—Can be operated directly from house current if used with NORDEN-HAUCK POWER UNIT AB-2.

The NORDEN-HAUCK SUPER-10 is available completely constructed and laboratory tested, or we shall be glad to supply the complete engineering data, construction blue prints, etc., for those desiring to build their own receiver.

Upon Request A complete catalog, attractively illustrated, will be gladly mailed without charge, or full size constructional blue prints, showing all electrical and mechanical data, will be promptly mailed postpaid upon receipt of $2.00

Write, Telegraph or Cable Direct to

NORDEN-HAUCK
Incorporated
ENGINEERS
MARINE BUILDING
Philadelphia, U. S. A.
Cable address "NORHAUCK"

TEAR OFF AND MAIL TODAY

NORDEN-HAUCK, Inc.
Philadelphia, U. S. A.

Gentlemen:—

☐ Please send me without cost or obligation on my part, attractive illustrated literature describing the new Norden-Hauck Super-10.

☐ I enclose $2.00 for which please send me, postpaid, complete full size constructional drawings and all data for building the Super-10.

Name.....

Address.....

YOU NEED THIS ACME RADIO CONTROL SWITCH

ENTIRELY AUTOMATIC IN ITS OPERATION

When the receiving set is turned on, the Trickle Charger is automatically disconnected from A Battery and B Power Unit is connected to set. When set is turned off, it automatically connects the Trickle Charger to the storage battery and starts the charge, disconnecting the B Eliminator from the set and line.

This switch may be used with any set regardless of type of charging equipment. Attractive in appearance. Guaranteed.

$5 complete, East of the Rockies

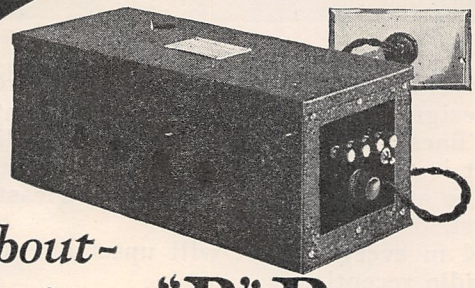
Acme Battery Charging Equipment is nationally known for its excellent performance.

The ACME TRICKLE CHARGER

An exceptionally fine economical product. Has a specially designed transformer with independent windings. Delivers ½ to ¾ amp. and consumes 25 to 40 watts. Attractive. Efficient. East of the Rockies..... $6
2 ampere bulb, $4

Manufactured for 10 years by

THE ACME ELECTRIC AND MANUFACTURING COMPANY
1412 HAMILTON AVENUE - - - - - CLEVELAND, OHIO



Read about-

Precision "B" Power Unit

90 VOLTS $37.50 Complete

Here is without a doubt the finest, most efficient B-Battery Eliminator ever developed, with an unheard of condensing capacity—100 microfarads. 120 milliampere output on 90 or 135 volts—absolutely quiet. A guaranteed eliminator that will last for years. Write us today for particulars giving your dealer's name.

135 VOLTS $42.50 Complete

Precision Electric Mfg. Corp.
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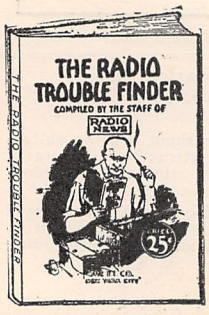
PEMCO Trickle Charger $8-less tube

PEMCO Trickle Charger $8-less tube

A Book for every Radio Set user!

The Radio Trouble Finder



200 ILLUSTRATIONS
SIZE 6 x 9 INS.

No matter how much or how little you know of your radio receiver, this new "Radio Trouble Finder" book is going to be a big help.

Gives special simple tests by which you can determine what is wrong with your receiver. Then for each particular fault there is explained the proper procedure for correcting it.

All troubles and their remedies are arranged in simple charts so that even the most inexperienced radio user will have no trouble in keeping his set at all times in first class condition.

25c—ON ALL NEWSSTANDS

THE CONSRAD CO., Inc., 64 Church St., New York

plate circuit, V_o in Fig. 5, is constant. Therefore, if we divide this voltage by the total impedance for various frequencies we will obtain a curve which shows how the plate current I_p varies with the frequency. For instance, divide the voltage, V_o, by the impedance, Z_1, at the frequency f_1 and we obtain the plate current, I_1, at that frequency. By doing this for various points on the Z curve, we obtain the curve shown at 6A, marked I_p.

This curve tells us something interesting, which it is probable may not have occurred to the reader before. If we have an alternating voltage applied to the grid of a tube, and increase its frequency from a very low to a high value, keeping the voltage the same, the current in the plate circuit will decrease from a definite value at zero frequency (direct current) as the frequency is increased.

Now we will look at Fig. 6B, and in interpreting it will make use of some of these things we learned from Fig. 6. Suppose we take the plate current at zero frequency and multiply it by the resistance r_p. We will then obtain the voltage drop in r_p, which may be represented by the length of the line Oa. If we multiply the current at zero frequency by the reactance at zero frequency (which is 0), we will get zero, so that at zero frequency there is no voltage drop in the transformer. Now do the same thing at the frequency f_1; multiply the current I_1 by the resistance r_p and obtain the voltage drop Ob. Again multiply the current I_1 by the reactance X_1 and obtain the voltage drop bc. Note that we have again formed a right triangle; for the same law applies to the voltage drops across the resistance and reactance as to the resistance and reactance themselves, provided of course, the current is the same in each, as it is in this case.

THE PERFECT CHARACTERISTIC

If we now project the point c horizontally to the vertical line corresponding to the frequency f_1, we have the point d representing the voltage across the transformer primary at that frequency. By doing this successively for several values of the frequency we get a complete curve, showing how the voltage impressed at the transformer terminals varies with frequency. Note the similarity between the appearance of this curve and the usual *amplification characteristic.*

If we had a perfect transformer, without resonance peaks, we could simply multiply every point on this curve by the turns ratio of the transformer and the amplification con-

40 Non-Technical Radio Articles

every month for the beginner, the layman and those who like radio from the non-technical side.

SCIENCE & INVENTION, which can be bought at any newsstand, contains the largest and most interesting section of radio articles of any non-radio magazine in existence.

Plenty of "How To Make It" radio articles and plenty of simplified hook-ups for the layman and experimenter. The radio section of SCIENCE & INVENTION is so good that many RADIO NEWS readers buy it solely for this feature.

Radio Articles Appearing in the November Issue of "Science and Invention" Magazine.

Increasing Selectivity In Your Radio Set.
By A. P. Peck.
The Home Set—How to Build an Extremely Sharp-Tuning Receiver, Complete With "B" Eliminator.
Novel Dial Set.
By Herbert E. Hayden.
A Micro-Adjustable Dial.
By Clyde E. Volkers.
Unique Crystal Hook-Up.

stant of the tube, and obtain the true amplification characteristic of the complete stage. This would also require that the load to which the secondary is attached have infinite impedance so that the secondary winding would carry no current. Of course, such a condition does not occur in practice; but this method of analysis can be applied to determine approximately the operating conditions.

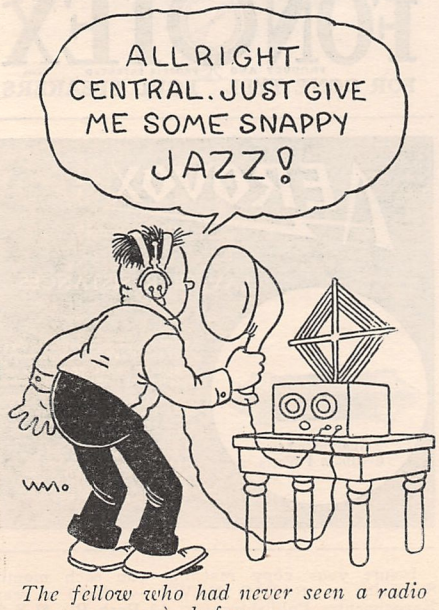
Now, to discuss the curves. When the frequency is low the reactance is low; the total impedance is therefore low and is determined mainly by the plate resistance. As the frequency increases the reactance increases. This increases the circuit impedance and decreases the current. The decrease of current causes the drop in r_p to lessen. But the reactance increases at a greater rate than the current decreases, so that *the voltage drop in the transformer increases with the frequency.* With the resistance drop decreasing and the transformer voltage increasing, it is seen that as the frequency increases the transformer assumes a greater and greater proportion of the total voltage.

As the frequency becomes very high the transformer voltage approaches a maximum constant value. This must be so; as it is not possible to get a voltage on the primary terminals higher than that which is available at the plate. This is shown at the left of Fig. 6B. In the first place the arc ac is part of a circle, because the developed voltage V_o, which is the same as Z_1I_1, remains constant; and the radius of the arc is of course constant. The largest value that the voltage drop in the reactance can have is obtained by swinging Z_1I_1 into a vertical position. Then the reactive drop will be represented by the radius of the circle, which is the total available voltage in the plate circuit. This is the limiting case, and is not quite realized in practice.

This diagram can be used also to show why a high transformer reactance is desirable. Suppose at the frequency f_1 the reactance was greater than X_1. Then the reactive drop X_1I_1 would be drawn in the position of the dotted line in the circle diagram; the resistance drop would be smaller, and the voltage on the transformer primary would be indicated by the point e instead of d. The characteristic would then be higher at the low frequencies, although the limiting voltage would be the same.

In this article we have considered qualitatively the operation of the transformer; the next will deal with some points of practical design, such as the best turn-ratio to use, the required impedances, and the factors which influence the selection of these.

WRONG NUMBER!



The fellow who had never seen a radio before.

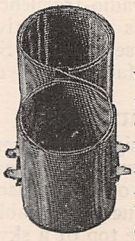
Buy by the Name

Success in Set Building Begins at the Dealer's Counter

ALL BENJAMIN RADIO PRODUCTS ARE OF THE SAME HIGH STANDARD AS THE FAR-FAMED CLE-RA-TONE SOCKETS

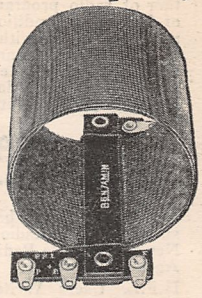
Cle-Ra-Tone
Spring Supported—Shock Absorbing Sockets
Stop tube noises. Greatest aid to non-noisy operation. Contacts always clean.
75 cents each

When you buy your radio parts, buy them right. Everything else being equal, when a name has stood for a quarter of a century's striving toward technical perfection it is practically as safe as a formula as a guide to right buying. When your dealer sells you Benjamin radio products for your set you have already leaped a big hurdle on the way to success.



"Lekeless" Transformers
Uniform high inductance, low distributed capacity and low resistance. The external field is so slight that it permits placing coils close together without appreciable interaction.
Single Transformers, $2.50

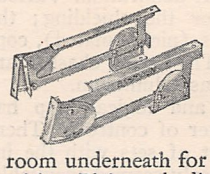
Improved Tuned Radio Frequency Transformers



Proved through exhaustive and comparative tests to be the most efficient coil for modern radio sets. Better in all important features and characteristics. Space wound. Basket weave. Cylindrical. Highest practical air dielectric. Gives wonderful sharpness in tuning, better volume and purer tone quality.

2¼" Diameter Transformer
Compact. Especially desirable for crowded assembly. Eliminates interfering "pickup."
Set of three, $5.75 ***Single Transformer, $2.10***

3" Diameter Transformer
Capacity coupling reduced to lowest degree. For use with .00035 Mfd. Condensers.
Set of three, $6.00 ***Single Transformer, $2.25***

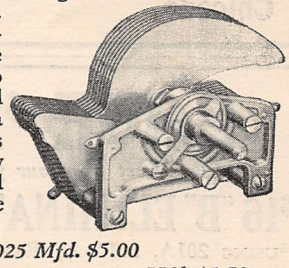


Brackets
An aid to simplification in set construction. Supports sub-panel, with room underneath for accessories and wiring. Plain and adjustable.
Plain, 70 cents per pair
Adjustable, $1.25 per pair

Battery Switch
Quick, positive, clean-cut make and break. When it's "in" it's "off," eliminating danger of wasteful use of battery.
30 cents each

If your dealer cannot furnish you with Benjamin Radio Products send amount direct to our nearest sales office with his name and we will see that you are promptly supplied

Straight Line Frequency Condensers
No crowding of stations. The broadcast range is spread evenly over the dial. Stations come in without interference, and tuning is much easier. Adjustable turning tension.
Low loss characteristics give a definite and distinct radio reception. Beautiful in appearance—a credit to the looks and efficiency of any set. Finished in dull silver. Made in three sizes:



.00025 Mfd. $5.00
.00035 Mfd. $5.25 ***.0005 Mfd. $5.50***

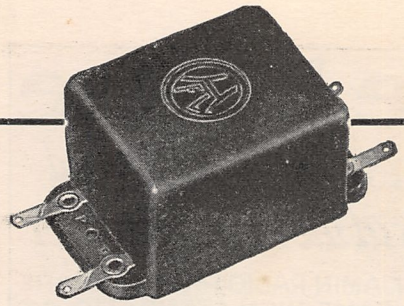
REWARDS FOR RADIO REASONERS

Awards for novel and original hookups, modifications of existing circuits; trade names; slogans. Write our nearest office for full details.

Benjamin Electric Mfg. Co.

New York 247 W. 17th Street — 120-128 South Sangamon Street Chicago — San Francisco 448 Bryant Street

Manufactured in Canada by the Benjamin Electric Mfg. Co. of Canada, Ltd., Toronto, Ontario



From
Atlantic to Pacific
From
Canada to South America

Registered H F L U. S. Pat. Off.

TRANSFORMERS

Have Made Finer Radio Reception Possible

These improved transformers assure selection of radio programs at choice, regardless of broadcast conditions. They combine tremendous power with a purity of tone that is unexcelled and amplify the weakest signals to full loud speaker volume. They operate with all standard tubes. Unsurpassed for quality, clarity and volume.

PRAISED ENDORSED---APPROVED

H.F.L. Units have been heartily endorsed by such leading Radio Authorities as Radio News—Citizen's Radio Call Book—and Radio Age.

H.F.L. Users Write: "Picked up Rome, Italy, from Evanston. Also Aberdeen and Edinburgh." "Lima, Peru came in on my H.F.L. Receiver with full loudspeaker volume." Get coast to coast from Chicago regularly using H.F.L. Units."

Jobbers Write Today Dealers—

No. H.210 Transformers	$8.00
No. H.215 Transformer	8.00
No. F.320 Transformer	8.00
No. L.425 R.F. Choke	5.50
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HIGH FREQUENCY LABORATORIES
129 N. Wells Street
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SAVE $25

Buy direct from our factory

$16 "B" ELIMINATOR A.C. & D.C.

*USING 201A, 301A OR RAYTHEON TUBE

We invite comparison with all others

Delivers up to 150 volts. 10 to 30 mille amperes, variable controls on amplifier and detector outlets. Additional amplifier outlet and control $2 extra.

NO HUM! NO TRANSFORMER HEATING!
10 days trial. Money returned if desired.

*Send postal for descriptive circular

U-FLEX TUBE REJUVINATOR $4.00
25 cts. extra for parcel post.

U-FLEX Mfg. Co, No. 1 S. 39th St., Phila., Pa.

$500 Prize Contest

(*Continued from page* 480)

(12) The prizes of this contest will be awarded to those submitting, in the opinion of the judges, the cleverest titles.

(13) The judges of this contest will be a board composed of the Editors of RADIO NEWS, and RADIO INTERNACIONAL. Their findings will be final.

(14) Should two or more persons submit the title considered best, second best, etc., each will be awarded the prize tied for.

The Third Annual Radio World's Fair

(*Continued from page* 495)

retained by increasing the number of tubes, which no longer is an extravagance; the shielding of each stage of radio-frequency amplification further improves the sensitivity and, at the same time, the selectivity. So that nowadays a loop is satisfactorily effective.

SUBSTANTIAL CONSTRUCTION

It is the mechanical design, however, which attracts the eye. In general, the new receivers all look like a series of metal cases anchored to a metal superstructure capable of withstanding a fall from the top of a skyscraper. The absence from view of coils, condensers and tubes is very novel; the compactness of the units and their mechanical beauty elicit nothing but admiration. Various materials are used for the shielding; the most common are brass (nickel-plated), copper and aluminum. The metal chasses are in most instances of cast aluminum.

Another important and logical step has been taken in the matter of controls. There are still a fair amount of sets with the inevitable, or what formerly seemed inevitable, three dials; but the new "man-o'-war" models, when slipped into a cabinet and fastened there, turn out to have no more than two controls and in many instances only one. With but a few exceptions kilocycles have been forgotten; as it seems there is no educating the public to them; and indicators have degree readings, wavelength readings, or both. Most of the loop-operated sets are calibrated, as well as a great number of the outfits designed for use with outdoor aerials.

ELECTRICAL CHARACTERISTICS

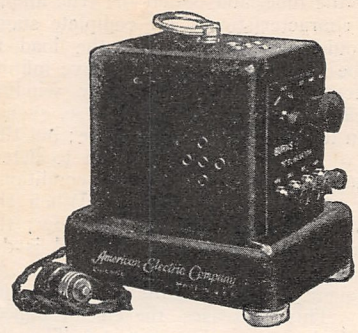
The advances made in the art of shielding have placed the manufacturers in a position to employ more than the usual two stages of tuned-radio-frequency amplification; and we find that the percentage of outfits using three, four, or even five stages of tuned R.F. is quite high. All of the stages are linked and tuned by a single control; the two-control sets have a separate condenser for tuning the antenna circuit.

The company which pioneered in shielding has blazed another trail equally important; i. e., in the liberal use of radio-frequency by-passes and chokes. This procedure alone has made a great improvement in many sets.

Considerable attention has also been paid to the audio end, as so much popular emphasis has been on "quality" of late. We find in evidence plenty of transformer-coupled audio amplifiers with the output stage designed for a power tube. The transformer still holds the manufacturing field, with three-stage-resistance and impedance-coupled amplifiers a little behind. The latter amplifiers are also designed to use a power tube in the last stage, thus avoiding distortion.

BATTERYLESS RECEIVERS

Among the sets exhibited were quite a few

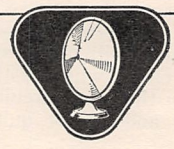


It Delivers
FULL "B" VOLTAGE
Burns
B-Battery Eliminator

Operates from lighting current like other household appliances. No hum or vibrations. Smooth constant plate supply. Once connected it requires no further attention or adjustment.

Popular Price—Write for Data.

American Electric Company
State and 64th Streets Chicago, U. S. A.
Makers of Burns Loud Speakers



Leading Makers Use This for Cones

Whether buying a cone type speaker at your dealer's or building one yourself at home, be sure that the *cone* is made of Alhambra FON-O-TEX. This remarkable product, adopted as standard by the leading cone speaker makers, gives tone-depth and roundness unobtainable with any other material.

For constructing large cones;—in sheets 38″ x 38″ at dealers. The Seymour Co., 329 West 16th Street, New York.

ALHAMBRA
FONOTEX
PRODUCT AND PROCESS PATENTED T.M.REG.
FOR CONE TYPE LOUD SPEAKERS

AEROVOX
"Built Better"

LAVITE RESISTANCES

Guaranteed to dissipate 4 Watts

AEROVOX products are used by over 200 of America's Radio Manufacturers.
AEROVOX Fixed Condensers are approved by M.I.T. and Yale Universities
AEROVOX WIRELESS CORP
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designed to operate directly from the electric-light mains, no batteries of any sort being required. Batteryless receivers have been brought to such a high state of perfection within the last year that they can be considered entirely practical. The majority of these have the filaments of all the vacuum tubes connected in *series*, so that the total amount of current drawn is comparatively low. This arrangement allows the use of a small rectifier tube (where the set is to be operated from alternating current) of low current capacity. No more than the usual space allotted to batteries is required.

"A" AND "B" POWER UNITS

This year also brings us many new "A" and "B" power units. There are a multitude of "B" battery eliminators, some of which incorporate a power amplifier for distortionless amplification and volume. The eliminator in this case supplies the "B" current for both the set and the power tube; the filament of the latter is lighted by unrectified alternating current, obtained from a special winding on the step-up transformer. All of these units can be used in conjunction with any receiving set by making the proper connections.

Most of the "A" power units exhibited were of the type comprising a low-capacity storage battery in connection with a trickle charger. They are bound to be in demand this year for the simple reason that they require practically no attention.

LOUD-SPEAKERS

The demand for quality has brought forth a myriad of new loud-speakers of varying types. The trend is towards cone speakers of the free-edge design; though there remain—for "sound reasons" as an advertisement has it—many adhering to the former methods of attaching the edge of the cone to a circular wooden baffle or to a "reverse cone" anchored to the base framework. Most of the free-edge cones are mounted in some form of metal or wooden case.

Among the newer types are the fixed-cone speakers with driving rods off center to eliminate resonance points and prevent the creation of harmonics. Some of these speakers take the shape of an oval and range in diameter from 18 to 36 inches. Many of the well-known manufacturers have introduced three foot cone speakers; though much has been said to the contrary, these instruments operate very satisfactorily on a small amount of energy. A power amplifier is not necessary, though much greater volume can be obtained by the use of one. It seems certain that a great number of these large speakers will be sold during this season, as they are far superior to the smaller types so far as true reproduction is concerned.

EXPLOITATION OF CIRCUITS

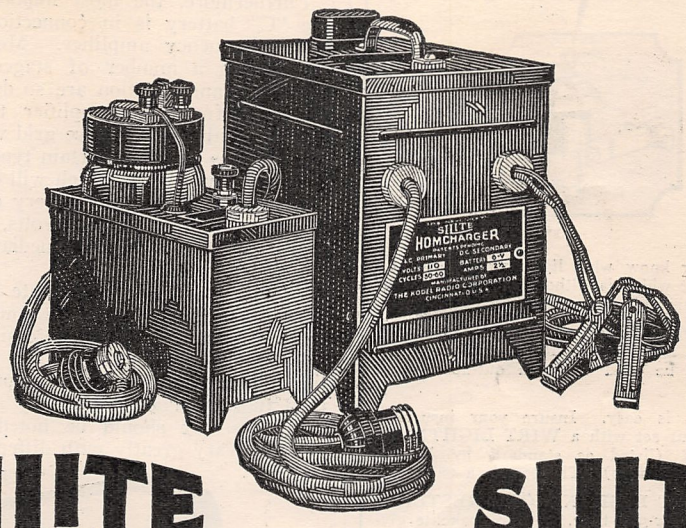
Another true indication of the sure-footedness of the industry as a whole is evidenced in the exploitation of recently-patented circuits. Many licensing companies have been formed for the sole purpose of capitalizing a single original idea. A few years ago it was next to an impossibility to market successfully ideas and protect the manufacturers licensed to use them. The situation, as seen today, is quite different.

DO RADIO WAVES INCREASE FERTILITY?

William Boot, an amateur gardener near Nottingham, England, propounds the theory that garden vegetables grow more profusely under the influence of radio waves. Boot believes that the proximity of a large aerial increased the fertility of his garden thirty per cent.

Experiments are said to be under way at Nottingham to determine the feasibility of "wireless fertilizer" not only in hothouses but for field crops as well.

A-B & C Light Socket Power



SILITE TRICKLE CHARGER — **SILITE HOMCHARGER**

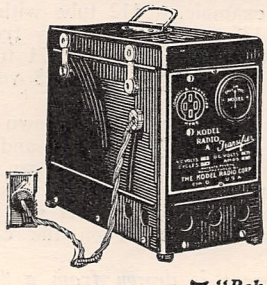
Your battery troubles are over, at last. Now all radio power is in your light socket.

For continuous unfailing "A" current, connect either the Silite Homcharger or the Silite Trickle Charger to your present storage battery. Absolutely noiseless, without bulbs, moving parts, or adjustments, Silite Trickle Charger makes a power unit of your battery—keeps it always at top efficiency. Left permanently on charge, Silite Trickle converts light socket current into radio power and stores it in your battery ready for use at any time—you simply forget about battery charging forever. For exceptionally large sets where a high charging rate is necessary, the Silite Homcharger is recommended. Either model may be used while the set is operating.

SILITE TRICKLE CHARGER	SILITE HOMCHARGER
.6 ampere charging rate.	2½-3 ampere charging rate.
Complete.....$10.00	Complete.....$19.50

Kodel A&B Transifiers

Kodel A and B Transifiers actually deliver all A, B, and C current direct from the light socket—smooth, constant, never-failing power that operates your set always at its greatest efficiency. Vastly different from and superior to the ordinary power unit, Kodel Transifiers consume current only while the set is operating—maintenance cost is less than one-half cent for every hour you use your set. Any radio dealer can show you Silite Battery Chargers and Kodel Transifiers.



MODEL 10 "A" TRANSIFIER
Supplies 2, 4, or 6-volts "A" current direct from the light socket. For sets using up to 10 tubes..... $42.50

MODEL 10 "B" TRANSIFIER
22½ to 150 volts "B" current; 4 to 10 volts "C" current for any size set. Operates power tubes..... $42.50

MODEL 61 "B" TRANSIFIER
22½ to 90 volts noiseless "B" power for sets up to 6 tubes..... $28.50

(Bulbs extra)

"Behind the Scenes in a Broadcasting Station" an interesting 24-page booklet, will be mailed free on request, together with literature describing Silite Chargers and Kodel Transifiers.

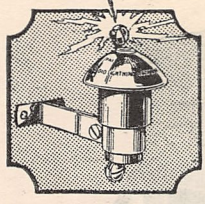
The Kodel Radio Corporation, 501 E. Pearl St., **Cincinnati, O.**

Owners and Operators of Broadcasting Station WKRC

Battery Chargers Power Units **KODEL** *Radio Receivers Loud Speakers*

POWER SPECIALISTS SINCE 1912

Save Your Set From Lightning



You never know what lightning will do and any radio set which is without the protection of a lightning arrester is at the mercy of a storm.

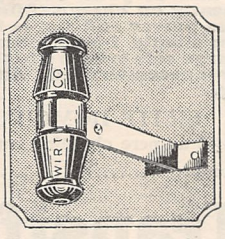
The National Board of Fire Underwriters specify that an approved Radio Lightning Arrester must be used with all out-door aerial installations.

Protection is easy. Insure your insurance and save your set with a WIRT LIGHTNING ARRESTER (listed as standard by Underwriters' Laboratories). The cost is a trifle.

THE WIRT LIGHTNING ARRESTER is an approved air-gap type, made of bakelite giving ample insulation, with brass terminals moulded in bakelite, far enough apart so that there is no leakage. A "petticoat" of bakelite shields the Arrester from water and dust. Handsome and rigid. Lasts a lifetime. Easy to install. Full directions on box.

Don't wait for a warning from the elements—it may be too late then. Install the WIRT LIGHTNING ARRESTER—now.

When you install your WIRT LIGHTNING ARRESTER, get a WIRT INSULATOR and prevent leakage along your lead-in wire. It keeps the wire at the proper distance, provides perfect insulation, and prevents wear and tear on the wire by preventing sagging and swaying.



The Wirt Lightning Arrester is listed as standard by Underwriters' Laboratories.

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WIRT INSULATOR ..... .35

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SEMINOLE CO., Dept. RN
427 East 16th St., New York

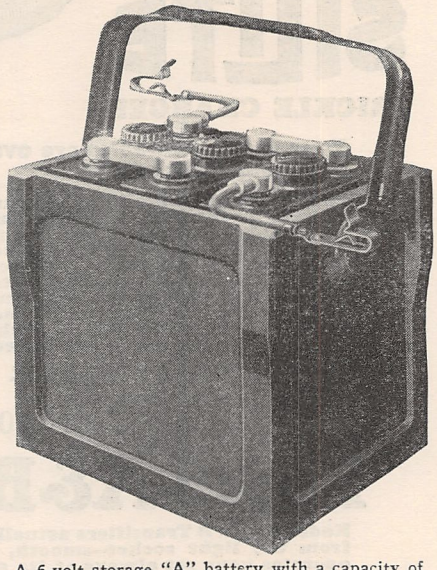
Radio Batteries and Their Care

(*Continued from page* 479)

"B" batteries. The amount of negative "C" battery voltage to use is dependent on a number of factors, but principally on the type of vacuum tubes used and the voltage of the "B" batteries.

Furthermore, the most important use of the "C" battery is in connection with the audio frequency amplifier. Most sets incorporating a number of stages of radio-frequency amplification are so designed that the radio-frequency amplifier tubes get a sufficient value of negative grid voltage. One exception is found in certain types of superheterodyne receivers, which will draw an excessive amount of "B" battery current if a "C" battery, of about 1½ volts, is not used in connection with the intermediate-frequency amplifiers.

At any rate, it is pure waste to operate a present day audio-frequency amplifier without a "C" battery. You can easily determine how much you should use by referring to the voltage tables which accompany the vacuum tubes you are to employ as the audio amplifiers. It should be noted that these voltages vary greatly with different types of



A 6-volt storage "A" battery with a capacity of 90 ampere-hours

Photo courtesy of Willard Storage Battery Co.

tubes. As an example, a 112 tube with a "B" battery of 135 volts requires only from 9 to 12 volts "C" battery, while a 171 tube with 180 volts "B" battery uses 40.5 volts "C" battery.

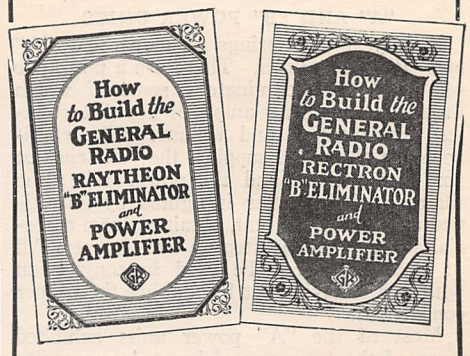
Two typical "C" batteries are shown in Fig. 2. B is a 4½-volt "C" battery, and C one of 22½ volts. The latter type can be used as a "B" battery by taking off the card attached to the binding posts, and making the connections as indicated on the case itself.

Since no current is drawn from a "C" battery, it has an exceptionally long life. However, in time it will drop in voltage. When a 4½-volt "C" battery drops to 3 volts it should be discarded. In other words, any "C" battery whose voltage has dropped 30 per cent. of its original value should be replaced. Test them in the same manner as you test your "B" batteries; with a voltmeter.

STORAGE "A" BATTERIES

We have already discussed storage batteries, but there is a great deal which yet remains unsaid. We have seen how we can get the most out of our dry-cell "B" bat-

Ask your dealer or write for these books



These booklets contain full information for building and operating a Rectron or Raytheon Plate Supply unit and Power Amplifier. In addition to schematic diagrams they contain full scale pictorial diagrams showing exact arrangement of parts and actual connections—Every amateur builder of radio should get copies of these booklets before building a "B" eliminator.

They are free for the asking—WRITE TODAY.

GENERAL RADIO Co
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LOW WAVE
Stations—Amateurs

Experience a new radio thrill! Explore the short waves on which super-power stations are experimenting daily and amateurs are talking from all parts of the globe. Enjoy a new radio delight with the

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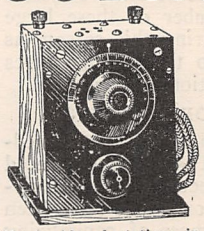

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Gets the Short Wave Experiment Stations broadcasting on 41 meters, 63 meters, etc., and a wide band of Amateurs' Stations.

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teries by the use of an attendant "C" voltage. Now the question is, how can we get the most out of our "A" battery? In this case we cannot conserve the current as we do with "B" batteries; the amount used is dependent solely on the number and type of tubes used and how much the set is operated. However, we can be sure to get the most out of the battery by giving it proper care.

There are but a few things to remember in connection with the care of a storage battery. Every battery of this type contains an "electrolyte" which is, with the exception of the "Edison cell" batteries, nothing more than so many parts of sulphuric acid mixed with so many parts of water to form a fluid having a certain "specific gravity." None of the sulphuric acid is ever lost, unless it is spilled out of the battery, but the water evaporates. Therefore, more water, and *it must be distilled water,* should be added at times to make up for that lost by evaporation. The electrolyte should always be above the level of the plates in each cell of the battery. The level can be determind by taking off the vent cap on each cell, so that the interior can be inspected.

Keep the terminals on your battery clean, do not allow any corrosion to accumulate. They can be kept clean if a bit of vaseline is smeared over all the lead parts; but be sure all the parts are clean before putting the vaseline on.

KEEPING TAB ON THE BATTERY

The battery should be recharged before it is "run down." How can we tell when it is *starting* to run down? If there are rheostats on your set you will find that it is necessary to turn them up higher when the storage "A" battery is dropping off in voltage. Or you can tell by using a voltmeter, measuring either the voltage across the filaments of the tubes or the voltage of the battery direct. But none of these methods is actually indicative of the true condition of the battery and to be fully relied upon.

There is only one effective way of determining the condition of a storage battery and that is by testing it with a "hydrometer." Two of these instruments are shown in Fig. 6. By drawing some of the electrolyte out of a cell in the battery up into the glass barrel, its *specific gravity* can be measured. The glass bob inside the hydrometer barrel will float in the liquid; the figures on the stem of the bob which appear on a level with the surface of the electrolyte indicate the specific gravity of the latter.

The electrolyte from the cell of a fully-charged battery should have a specific gravity reading between 1.275 and 1.300. The three cells composing a 6-volt storage battery are isolated from each other; therefore *use the hydrometer on all three,* not just one. Two of the cells might give a normal reading, when the third was under-charged. Don't overlook this point.

If the electrolyte in one cell is low in its specific-gravity reading, leave the battery on charge for a greater length of time and give this cell a chance to pick up; a slight excess charge will not harm the other two cells just so long as it is not continued for too long a period.

As to the lower limits; when the electrolyte drops to a specific gravity of 1.200 it is time for the battery to be re-charged. It is best to start re-charging it even before it reaches this figure; say at 1.210. The battery is entirely discharged, when the specific gravity falls to 1.150. Remember that a voltage reading, either before or after a charge, is no suitable method for determining the condition of the battery.

We will say more about charging when we come to discussing the various types of chargers for both "A" and "B" storage batteries.

The New Triple Duty GOLD SEAL HOMCHARGER

The World's Most Popular Battery Charger

$19.50 Complete

Charges three times faster!
Rejuvenates lifeless tubes - supplies current for 8-volt power tubes!

It's more than just a battery charger—the new Triple Duty Gold Seal Homcharger. Charges three times as fast as other chargers — fully charges the average battery overnight. No bulbs — no liquids — Homcharger can be used for charging automobile batteries, too!

An exclusive Homcharger feature this season is the new tube rejuvenation process. Terminals are provided for bringing old radio tubes back to life without removing them from the set.

Homcharger may also be used as a power unit for 8-volt A. C. power tubes. Provides uniform light socket current for operating these tubes.

Only Homcharger offers these exclusive features—still Homcharger costs no more than ordinary battery chargers. Any radio dealer can show you the new Triple Duty Gold Seal Homcharger.

"Behind the Scenes in a Broadcasting Station" an interesting 24-page booklet, will be mailed free on request, together with literature describing the Triple Duty Gold Seal Homcharger.

The Kodel Radio Corporation, 501 E. Pearl St., **Cincinnati, O.**

Owners and Operators of Broadcasting Station WKRC

Battery Chargers Power Units **KODEL** *Radio Receivers Loud Speakers*

POWER SPECIALISTS SINCE 1912

The Pianorad

(*Continued from page* 493)

and as this amount of room was not then available in the studio of WRNY, for which the first Pianorad was especially constructed, the smaller instrument was built instead.

The Pianorad at WRNY is usually accompanied by piano or violin or both; very pleasing combinations are produced in this manner. At present it uses a single stage of amplification, giving volume enough, in connection with one loud-speaker, to more than fill a fair sized room. By adding several stages of audio-frequency amplification, sufficient volume can be obtained to fill a large church or auditorium.

The Pianorad was first demonstrated publicly Saturday, June 12 at 9 P. M., with a number of brilliant selections played on it by Mr. Ralph Christman; the concert being broadcast over WRNY at The Roosevelt, New York.

The principle embodied in this instrument was first demonstrated in 1915 by Dr. Lee de Forest, inventor of the Audion. At that time Dr. de Forest was able to produce musical tones by means of vacuum tubes, but the radio art at that time had not progressed sufficiently to make possible the Pianorad.

An article by Clyde J. Fitch describing the construction of the Pianorad will appear in the December issue of RADIO NEWS.

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No-Hum "B" Eliminator

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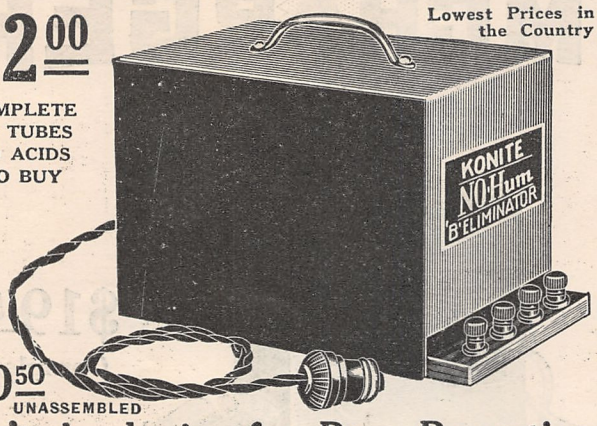

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Don't Apologize for Poor Reception

How many times have guests come to the house and you offered apologies for poor reception because your "B" batteries were "down and out"?

You can always depend upon the electric light company to furnish electricity and by just plugging into the light socket, you will always have a "B" battery supply for your radio set by using the KONITE "NO-HUM" B ELIMINATOR.

The voltage will never vary. If you use 22½ or 45 volts for your detector and 90 volts on your amplifier, the KONITE "NO-HUM" B ELIMINATOR will always deliver the specified amount of voltage. To get good volume from your set, you must supply the full amount of voltage required.

4 Taps B—; 22½ V; 45 V; 90 Volts.

The operating expense of current used is less than $1.00 per year dependent upon the rate of your local light company.

Works on 110 Volts A.C., 60 or 25 cycles—operates all sets from 1 to 9 tubes.

DEALERS—We have an excellent proposition for those who desire to handle our line. Write or wire for territory.

Konite Recti-Trickler

$4.50 Complete

CHARGES BOTH "A" and "B" BATTERIES

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LOWEST PRICED CHARGER MADE

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ELECTROLYTIC PRINCIPLE

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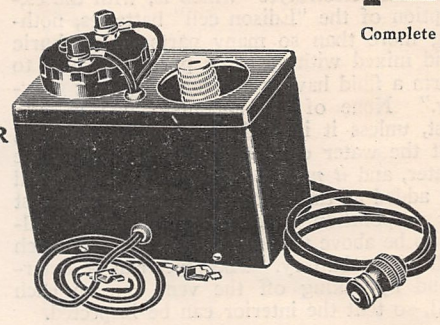

Absolutely Noiseless Charging

The RECTI-TRICKLER has been designed after an exhaustive series of tests to provide a self-contained unit at an extremely low cost, a unit that is practical and requires no attention.

It is a combination Rectifier and trickle charger all in one—Charges both A & B batteries (wet) from the house lighting cut—Works on DC or AC Current; all you need to do is to connect it to any house light socket, clip the two leads to your battery and it starts to operate.

No tubes, no acids necessary. The simplest unit of its kind—uses the electrolytic principle. No noise. The RECTI-TRICKLER is guaranteed against defects for six months.

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If your dealer does not stock them, THESE UNITS will be shipped C. O. D. to you if desired

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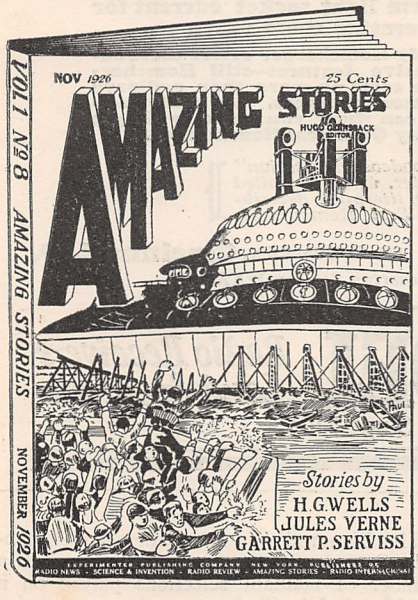

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The Second Deluge!

By Prof. Garrett P. Serviss

The sophisticated city of New York laughed at Cosmo Versal when he broadcast the terrible warning that the Second Deluge was coming with water over seven miles high. They laughed when he began to construct his great ark "to save a remnant of the human race and necessary animals, etc." They laughed even when the first omens he predicted appeared, but they should have listened "Terror was in store for them—extinction," but read the wonderful story. It's a masterpiece of Scientifiction—in the November issue of AMAZING STORIES.

AMAZING STORIES

Other Features for November:

THE MAD PLANET, by *Murray Leinster*. A tremendous story by the author of "The Runaway Skyscraper," and a sure classic. This fascinating story tells how our planet undergoes a gradual change and becomes inhabited by giant insects. A powerful, gripping narrative. Do not miss it.

BEYOND THE POLE, by *A. Hyatt Verill*. The final installment, wherein our explorer describes his further adventures as guest of the lobster-like race. Any number of surprises and scientific conclusions will be found in these chapters of the best new scientific story of the year.

THE ISLAND OF DR. MOREAU, by *H. G. Wells*. The final instalment wherein we find the beast people at large on the island, and learn what happens to them when left to their own devices. As surprising an ending as you could wish for with thrills that you follow breathlessly, and which you will never forget.

THE DIAMOND LENS, by *Fitz-James O'Brien*. This is one of the world's classics. A story written years ago, but which retains its flavor to the fullest extent and brings in an exquisite microscopic being, the enchanting heroine of the story. This was crowded out of the September issue.

A DRAMA IN THE AIR, by *Jules Verne*. A little known story by the famous author. It was one of the first stories ever published by him, and while it does not contain the great scientific interest of his later stories it is considered a perfect gem by followers of Verne literature.

Published by

Experimenter Publishing Co., Inc., 53 Park Pl., New York, N. Y.

STORAGE "B" BATTERIES

A storage "B" battery is shown in Fig. 7. The cells differ from those of a storage "A" battery in size only. It is not necessary that the cells be large as there is no need for a high *current capacity*. It is important, however, to have a high *voltage;* therefore there is a much larger number of cells.

The battery illustrated has 24 cells, giving a total of 48 volts. The capacity of the battery is 6,000 milliampere-hours (equal to 6 ampere-hours). When a battery of this type is fully charged it may give a voltage reading as high as 50 or 52 volts; it should be re-charged when the voltage drops to 45. If you continually let the voltage drop lower than this before re-charging, the battery is apt to become weakened. Though it is always best to keep check on all the cells in a storage "B" battery of this type with a hydrometer, (that is, taking the specific-gravity reading of the electrolyte in each cell) one is fairly safe in relying on voltage readings. Therefore, a voltmeter such as shown in Figs. 3, 4 or 5, can be used for determining the condition of a storage "B" battery before and after charging. It is advised, however, that each cell be checked with a hydrometer once every two or three months.

The storage "B" battery shown in Fig. 7 has a number of excellent features. First, the plates are large and rugged in construction and will withstand a great deal of rough treatment without weakening or breaking down. We can liken them to a bridge built to withstand a load much in excess of that which it will ever have to handle; it has a large "factor of safety." Second, the cells are so designed that the electrolyte level is a considerable distance above the top of the plates. Thus, a great deal of evaporation can take place before it is actually necessary to add more distilled water. Third, one of the cells has two small balls floating in the electrolyte, which give a visual indication of the specific gravity of the fluid in that particular cell. This indicator is of considerable convenience when recharging the battery. It is understood, of course, that it does not register the condition of the rest of the cells, but at least hints at it. It is perfectly logical to suppose that the entire battery is fully charged, when the two little balls in the one cell give such an indication. But use a voltmeter too, to be on the safe side, and use a hydrometer at intervals.

"A" AND "B" BATTERY CHARGERS

There are more chargers on the market than one can shake a stick at, but they all fall into definite types. Some of them are designed for charging storage "A" batteries, some for charging storage "B" batteries, and another type for charging both storage "A" and "B" batteries, though not at the same time. Then there is the "trickle charger," a newcomer in the radio field. We will explain its use later on.

Let us consider "A" battery chargers first. Figs. 8, 9 and 10 show a number of types designed for use on alternating current light lines. Some types have tube rectifiers, some electrolytic rectifiers, and a few mechanical rectifiers, as the captions indicate. All of these chargers are not suitable for all types of battery; this is dependent on the "charging rate" listed on the battery, which may be anywheres from 2 to 5 amperes. Accordingly, different chargers will pass a small or a high amperage. The charger shown in Fig. 8 will pass 2 amperes, the one shown in Fig. 9 will pass 5 amperes; while the one of Fig. 10 can be adjusted to pass 2½ or 5 amperes.

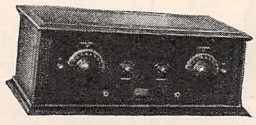
If the charging rate listed on your battery is 5 amperes, use a 5-ampere charger; if the rate is lower use a charger, which passes a corresponding amount of current. Of course, a 2-ampere charger can be used

NINE out of every ten radio fans know Browning-Drake. Since its introduction over two years ago, when Glen H. Browning and Frederick H. Drake set a mathematical standard of design for radio frequency transformers , a hundred thousand Browning-Drake fans have praised its distinct improvement in radio receiving.

This good-will, coupled with the nation-wide publicity following every recognized advance, has given Browning-Drake a place in Radio no dealer can afford to overlook.

One stage of scientifically designed radio frequency, incorporating the Browning-Drake transformer, together with the flexibility of a two control receiver, has yet to be improved upon for all around satisfactory reception. Constantly improved as new refinements are proved worthy, Browning-Drake has no yearly models to become obsolete.

Browning-Drake produces only one model, built complete at its Brighton laboratories. Sold at $95, a fair price steadily maintained, every Browning-Drake dealer has made money, and every Browning-Drake customer has been permanently satisfied.



The BROWNING-DRAKE FIVE

For further information address the Browning-Drake Corporation, Brighton, Mass.

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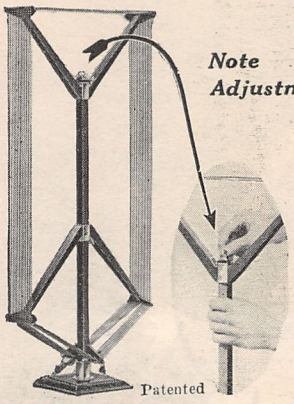

8000 MILE RECORD

The Quali-Tone Loop pictured above holds two World's Records for distant reception, having brought in stations 8000 miles away. Write for verification of these records. Exclusive Thumbscrew Adjustment keeps wires taut always.
Guaranteed to improve the performance of any receiver. Price $10

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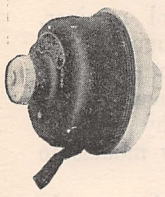

Quali-Tone DeLuxe Unit is an extremely powerful concert type built to handle extra heavy volume. Finished in black crystal enamel with nickel trimming. Adaptable to any standard make of phonograph or console set. Price $7.50
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Semi-dull black leather finish. Artistic design. Height 15" Bell 10"—Price $10

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Quali-Tone Junior

No. 4
The Speaker Supreme—Bakelite Bell—Base finished in dull black morocco leather fashion. Height 22½"—Bell 14"—Price $25

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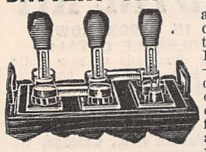
BATTERY TESTING SIMPLIFIED



and safeguarded with combination hydrometer and water gauge. Know when to charge—when to add water, one squeeze of bulb does both. This is an exclusive IN-A-CAP feature. It extends about 3" above battery, is properly vented so battery can be used and charged with hydrometer in place. It is not necessary to handle the instrument therefore it cannot drip, be misplaced or broken. Don't ruin your battery when it is so simple to care for. It insures longer battery life, protects rugs, floors, clothes, and makes certain good reception at all times. Tested and approved by leading radio publications. Sold on money back guarantee. 75c each. Set of three $2.00. Instructive pamphlet on care of battery mailed free on request. Dealers & Jobbers wanted.

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AT ATTRACTIVE PRICES. SETS OR PARTS.
Prompt and Honest Service. Write for Prices.
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to recharge a battery that has a 5-ampere charging rate, but the charging period will be much longer. If you want to put 90 ampere-hours of current into a battery you can do it in 18 hours with a 5-ampere charger, but it will take 45 hours if a 2-ampere charger is employed. Considering the fact that a battery is never allowed to become completely discharged, you would never have to put this amount of current into it. With a 60 ampere-hour battery the amount to be put back may be anywheres from 20 to 40 ampere-hours; or with a 90 A.H. battery from 40 to 60 ampere-hours. All depends how much you let the battery run down before recharging.

Two combination "A" and "B" battery chargers for use on A.C. lines are shown in Figs. 11 and 12.

The charging rate is, of course, very much lower for a "B" battery than for an "A" battery—usually about .25 ampere. The average charger of this type will accommodate a 48-volt storage "B" battery. If the "B" battery has a total voltage of 96 or 144 the two, or the three, units, as the case may be, should be connected in parallel; by which arrangement all the units can be charged at once. This is absolutely imperative as a 96-volt battery, of two units connected in series, would receive no current from the 110-volt light line; while a 144-volt unit would discharge into the light line, as it has the greater voltage.

A number of storage "B" batteries can be recharged in about the same length of time that it takes to charge a storage "A" battery at its normal charging rate.

When "B" batteries are to be charged an electric light bulb is screwed into the lamp socket on the charger. (These are included on each of the chargers shown.) The size of the lamp to use depends on the rate at which the "B" batteries are to be charged; this information is given by the manufacturer.

TRICKLE CHARGERS

Trickle chargers are something new to radio broadcast listeners, though they have been used for years in connection with commercial radio emergency equipment and storage-battery-operated installations. With this arrangement, the battery or batteries are put on a "floating charge;" and the amount of amperage put into them at one time is very small.

The original idea of the trickle charger was to keep storage batteries, employed in connection with emergency equipment, up to a fully-charged condition at all time. Since these batteries are very seldom used they

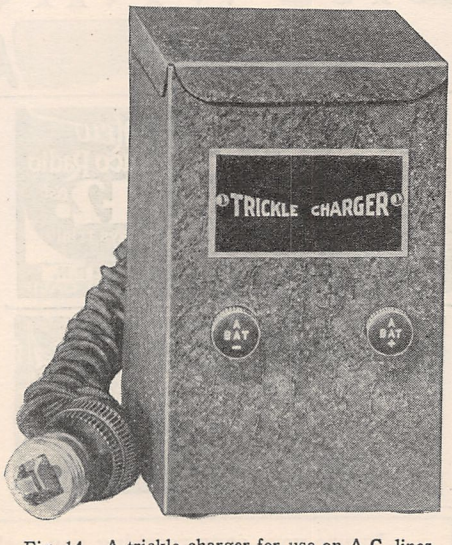
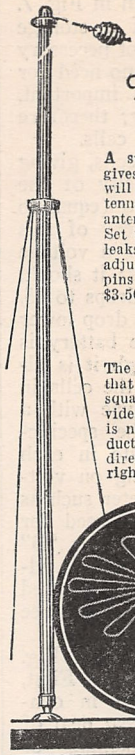


Fig. 14. A trickle charger for use on A.C. lines having a ½ to ¾ ampere charging rate.
Photo courtesy of Acme Electrical & Mfg. Co.

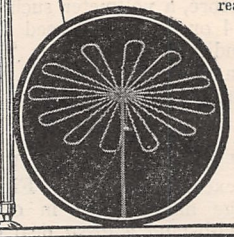
IMPROVE!
YOUR RADIO RECEPTION
By Using
The REDI-MAST FOR AERIALS (FITS ANY ROOF INSTANTLY)



A strong hand-turned rock maple pole which gives a dependable antenna. 5- or 8-ft. lengths, will fit any roof—single or multiple wire antennas. Will carry the heaviest sleet covered antenna in strong wind. Neat in appearance. Set up or dismantled without danger of causing leaks in roof. Complete, three steel guy rods, adjustable pulley, neb irons, roof sockets, anchor pins and full instructions, 5 foot mast, each $3.50, 8 foot mast, each $4.25.

WAVE-X

The WAVE-X Condensing Antenna is an aerial that can be quickly erected anywhere 5 foot square is available. Several on one roof. Provides sharper tuning, increases selectivity and is non-directional. Twelve durable highly conductive, non-corrosive feelers reach out in all directions. Perfectly insulated. Only one upright to erect, only a hammer and a screwdriver needed. No. 2, with 8 foot pole ready to install, full instructions $12.50.



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Zinke Company,
Chicago, Illinois

50% BETTER Reception with EFFARSEE Antennae or Your Money Back!

That guarantee shows how certain we are that the wonderful new EFFARSEE Antennae will increase the power, range and selectivity of your set. The scientific design of this marvellous device, built on an entirely new principle with two specially made condensers, practically eliminates static and interference.

Don't Imperil Your Life

Why clutter up your home with ugly outside wires or masts? Why take a chance of death by a fall when erecting or repairing an outside aerial? Why deliberately attract the deadly lightning that may kill your whole family and burn your home? Just buy your EFFARSEE Antennae, shove it under a rug or put it in the attic, and enjoy perfect safety and get 50% better reception. No trouble—installed in 30 seconds—lasts forever. Radio manufacturers find it ideal for testing sets. Approved by Radio News, Popular Scince, Popular Radio and other prominent Radio Magazines. Thousands of enthusiastic users.

Send No Money

Order your EFFARSEE Antennae today, at the special price of $4.00. If it does not improve the performance of your set at least 50%, return it and we will refund your payment in full. Send no money—just your name and address. We'll send your EFFARSEE Antennae at once, and you can pay $4.00 to the postman on delivery. Remember, you take ABSOLUTELY NO RISK.
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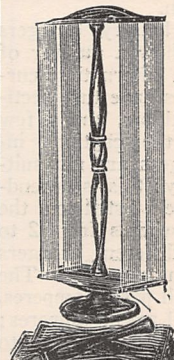
EXCELLENT RECEPTION with The THOMAS LOOP



The THOMAS LOOP combines the three qualities wanted by every radio set owner: Excellent reception, Beautiful design, Moderate price.

This loop is a highly satisfactory receiver on any 5-tube or superhetrodyne circuit using .0005 condensation. Guaranteed as to workmanship. Turns on a 6-inch radius—fine for small spaces. Hand rubbed, dark walnut finish that harmonizes with any furniture. A THOMAS LOOP answers the loop question for all time.

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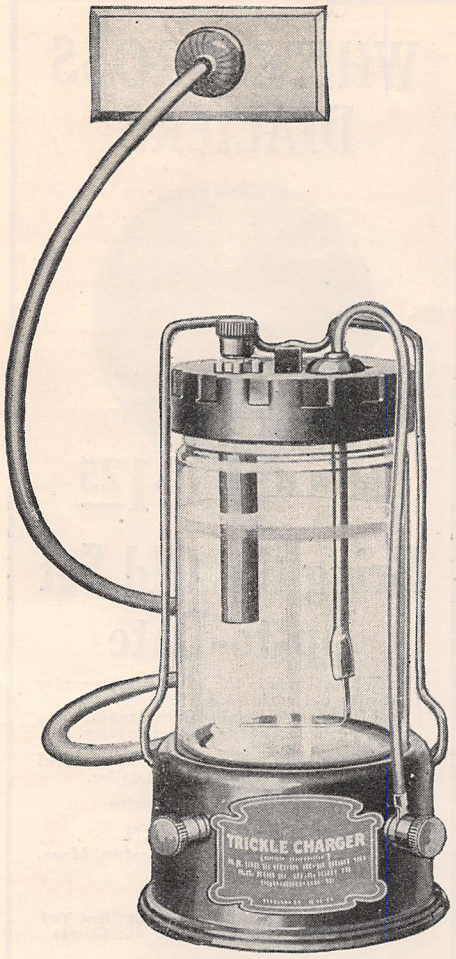


Fig. 16. A trickle charger of the electrolytic rectifier type having a charging rate of ½ ampere.

Photo courtesy of Vesta Battery Corporation.

would, under any other conditions, lose a good part of their current through an internal discharge between the battery plates. The use of a trickle charger compensates for this loss. It is necessary, however, to use these batteries occasionally, and recharge them at a high rate in order to keep the active material in the plates in a healthy condition. This would also be required in the general run of radio storage "A" batteries of fairly high ampere-hour capacity, to keep them from becoming stagnant. However, if a low-capacity storage battery is used (60 ampere-hours or less) a trickle charger can be employed to advantage, as the charging rate for one of these batteries is quite low in the first place. Consequently, if we start off with a fully charged 60 ampere-hour battery and keep it on a floating charge at all times when it is not being used, there is enough current put back into it to make up for that used by the tubes in

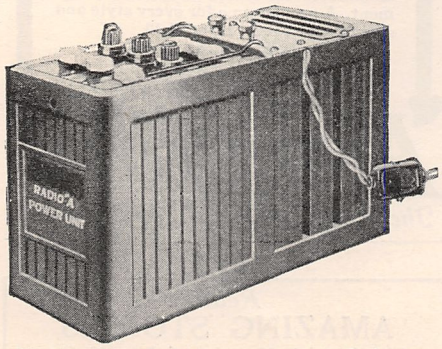
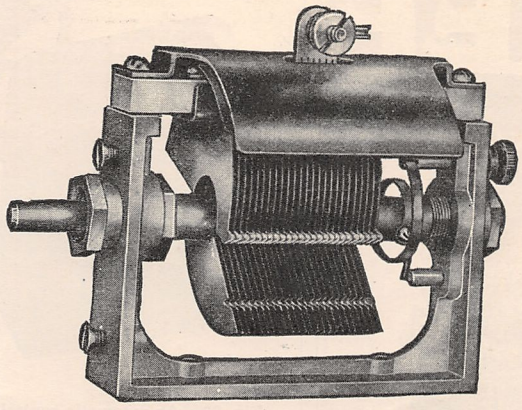


Fig. 19. A radio "A" power unit employing an electrolytic rectifier and a 40 ampere-hour storage battery. The charging rate is ½ ampere and the battery can be left floating on the line with the set in operation.

Photo courtesy of National Lead Battery Co.



Uniform Station Spacing All Over Scale

is assured by mathematically proportioned plates yet these Samson Uniform Frequency Condensers are the smallest made and easily fit into present sets. With them you can readily do away with the crowding of stations on your present receiver having ordinary condensers—where 85 out of 100 come in below 50 on the dial.

Samson Uniform Frequency Condensers are built to a tolerance of 1-1000 inch

These grounded rotor-type instruments have losses lower than the average laboratory standards.

This condenser, due to its design, does not have the defects caused by either solid metal or dielectric end plates. SAMSON Uniform frequency Condensers have a one-hole mounting. They can be mounted vertically or horizontally, and are guaranteed accurate within plus or minus 1% of their rated capacitances. For high frequency short wavelength work, or for other purposes where a condenser of relatively small maximum and minimum capacitance is desired, we can furnish the 125 and 75 mmf., stock models. Prices: 500 mmf., $7.50; 350 mmf., $7.25; 250 mmf., $7.00; 125 mmf., $7.00; 75 mmf., $7.00.

Our book—"Audio Amplification,"—already accepted as a manual of audio design by many radio engineers—contains much original information of greatest practical value to those interested in bettering the quality of their reproduction. Sent upon receipt of 25c.

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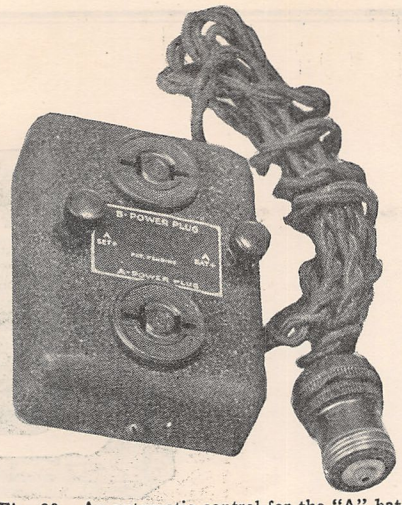

Fig. 20. An automatic control for the "A" battery and "B" power. When the set is turned off the "A" battery is automatically placed on charge and the "B" source disconnected.

Photo courtesy of the Acme Electric & Mfg. Co.

the receiving set. The amount of current passed by the trickle chargers is sufficient to keep a low-capacity battery in a healthy condition.

A number of trickle chargers for use on A.C. lines are shown in Figs. 13, 14, 15 and 16. The ones shown in Figs. 13 and 14 and 15 have an adjustable charging rate. If the battery has been used more than usual it can be given an added boost by giving it a higher rate of charge.

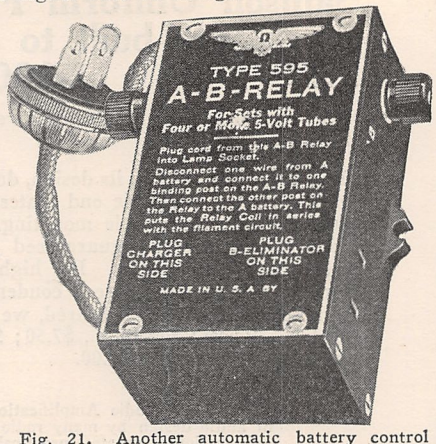

Fig. 21. Another automatic battery control which can be used in conjunction with any receiving set.

Photo courtesy of Jewell Electrical Instrument Co.

"A" POWER UNITS

This brings us to "A" Power Units, which are a combination of a low-capacity storage "A" battery and a charger or trickle charger, with a switch so that the battery can be put in circuit with the set or to the charger without having to connect or disconnect any wires. A number of units of this type all of which are for use on A.C. light lines are shown in Figs. 17, 18 and 19. The "A" Power Unit shown in Fig. 17 has an "On" and "Off" switch for the charger; when

(*Continued on page* 610)

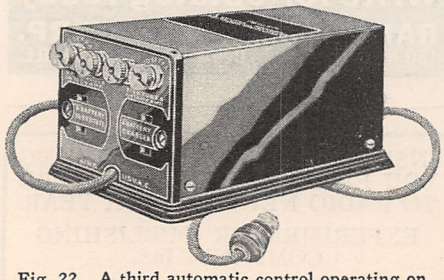

Fig. 22. A third automatic control operating on the same principles as the two shown above.

Photo courtesy of Forest Electric Co.

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Bring the Old Set Up-to-Date

The White Cross is the 360 degree vernier Dial with 6-1 ratio. Made of bakelite with beautiful rosette finish. Gives greater ease of tuning, selectivity and sensitivity.

Easy to apply to any set. Just remove old dial and attach White Cross Dialier.

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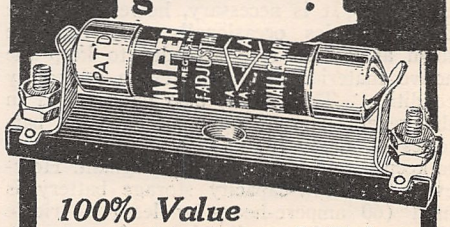

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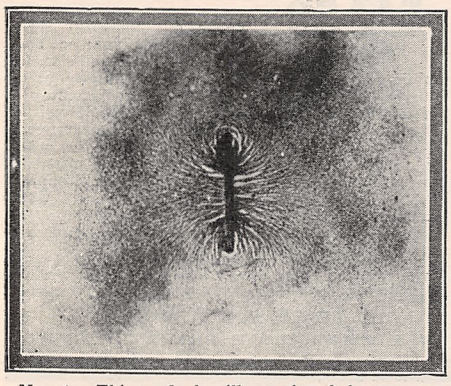
A Gang-Controlled Seven-Tube Receiver

(*Continued from page* 507)

amplifier tubes being made already inside the case. This is an important point to be remembered, as it is in the connection of the audio-frequency amplifier that many set builders come to grief. And what is the cause of this trouble? Merely the fact that two wires may be reversed to a transformer or coil. Set builders of experience will agree that more distortion and howls in the receiver are caused by the inability to get these relatively simple connections straight than by any other one fault.

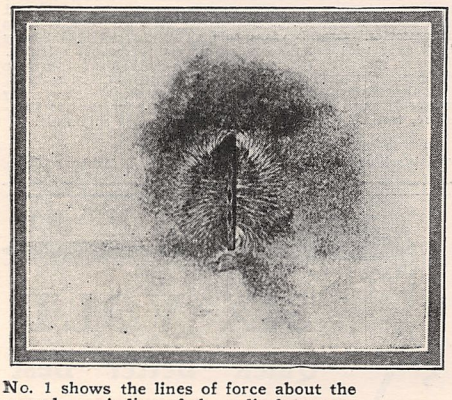


No. 1. This and the illustration below were made from photographs of the magnetic field of a radio-frequency transformer, made visible by using iron filings on a sheet of paper.

THE GANG-CONTROLLED CONDENSERS

Another feature, for which the set and parts manufacturers have been striving, is that of simplicity of control in tuning. There have been many different models of single-control receivers originated; and some of them have worked satisfactorily and others not so well. However, in the type of condensers which is installed in the receiver shown in the accompanying illustrations, simplicity of control is gained, as well as electrical efficiency.

With many single-control receivers the



No. 1 shows the lines of force about the secondary winding of the radio-frequency transformer excited with partly rectified AC. No. 2 shows the same coil with the primary excited and the secondary closed through a resistance, which throws the load on the secondary winding and changes the form of the magnetic field. It will be noticed in the lower illustration, No. 2, that the magnetic field is drawn inward and highly concentrated toward the coil; which makes it possible to enclose such a coil in a thin metallic container without loss of efficiency.

Photos by courtesy of F. W. Sickles Co.

At the right is shown the circuit diagram of the receiver, photographs of which are reproduced on pages 507 and 610.

For All Popular Makes and Circuits of Radio Receiving Sets

The General Radio Type 400 Power Amplifier and Plate Supply

Constant "B" Voltage with Power Amplification

Type 400

PRICE

$68

(without tubes)

This unit operates from 110 volt (60 cycle A.C. and provides plate voltages of 45, 90 and 130 in addition to supplying the proper plate voltage for the UX-171 tube of the power amplifier.

An outstanding feature of the type 400 is that it has no variable resistance voltage controls to get out of order and cause noisy reception. Voltages in this unit are controlled by fixed resistances tightly sealed from dust and moisture.

This unit is designed for the UX-213 Rectron rectifier tube and UX-171 power tube in the amplifier. It is contained in a metal case with black crystaline finish. The type 400 may be used to replace "B" batteries with all popular makes and circuits of radio receivers regardless of whether they may be operated by dry cell or storage battery tubes.

Once installed it requires no further attention and is ready for years of unfailing service.

Your dealer will be glad to give you a demonstration.

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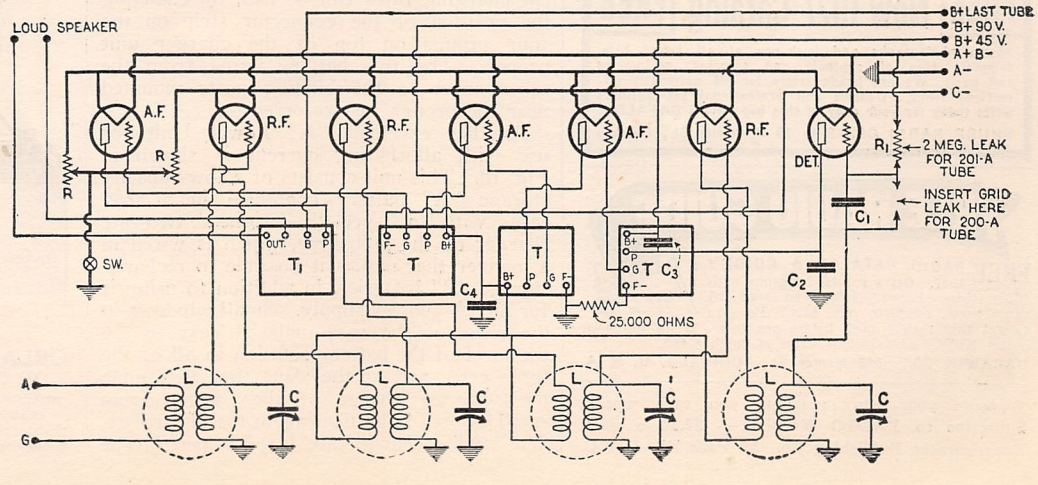

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The Bakelite construction, the phosphor bronze double contact springs, the convenient mounting plate with the permanently attached color guide for wiring tell you the unusual merits of this practical plug for quickly and conveniently connecting battery leads to your set.

The No. 660 is the plug illustrated $3.50

The No. 670 is the plug for the set with binding posts — no soldering. Just hookup the terminals to your set and batteries and the job is done...$4.00

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For the set builder who wants a thoroughly dependable jack in the junior size. Absolutely the same in every exclusive feature of design and construction as Yaxley standard jacks. All spring combinations from one to seven.

Midget Battery Switch

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A neat efficient filament control switch. Never gets out of order. One nut mounting. Hard rolled phosphor bronze springs. Pure silver contacts. Quick make and break. Furnished complete with "Off" and "On" plate, as illustrated, at 50c.

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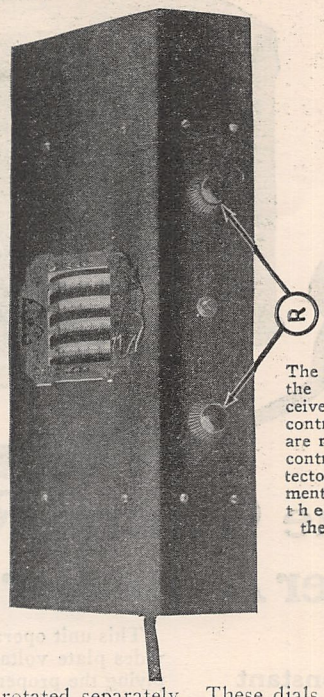
trouble has been that the radio-frequency stages of amplification are not tuned to exactly the same wavelength. This is caused by the inability of the manufacturer to produce apparatus uniform enough to accurately tune the two or three R.F. stages at the same time with one control.

With the condensers shown ease of tuning is accomplished by grouping together of the four tuning controls. This means that they can all be varied at the same time with one hand, or the individual condensers can be



The front view of the seven-tube receiver. The two controls marked R are rheostats, one controlling the detector tube's filament and the other the filaments of the other tubes.

rotated separately. These dials are numbered so that logging of stations is easy, using the indicator at the top of the slot through which the dials project.

It is claimed that this receiver is an excellent distance-getter and the ratio of radio-frequency-amplification attests this fact. In order to provide means of using tubes of the latest type, there has been installed in the circuit a double grid-leak mounting; so that a negative grid return can be used with the new 200-A type of detector tube. Also provision has been made for the use of a power-amplifier tube (type 112 or 171) in the last stage of the A.F. amplifier. For the first stage of audio-frequency amplification a tube having a high amplification factor ("High-Mu") should be used, to obtain the finest results.

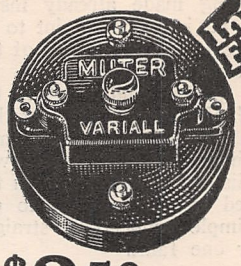
Batteries and Their Care

(*Continued from page 608*)

put to the "On" position this automatically disconnects the battery from the set and places the battery on charge. Four different charging rates can be had, by changing the position of the connector strip on the four prongs on top of the charger unit proper. The two battery wires from the set connect to the binding posts mounted near the prongs just referred to.

Another excellent "A" Power Unit for use with alternating current is shown in Fig. 18. This unit consists of a low-capacity storage "A" battery contained in a steel case with a specially-designed two-rate charger of the bulb type, which is wired in a manner that makes it possible to recharge storage "B" batteries, in addition to using it for an "A" power supply. Small windows in the sides of the case make it easy to see the level of the battery solution in all of the three cells, and at the same time determine the state of charge of the battery from small colored balls floating in the electrolyte. The trickle charge rate is ½-ampere. The

MUTER Interference Eliminator



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unacid everlasting rechargeable
"B" STORAGE BATTERY
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Includes chemical

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throw of a switch on the front of the case to "high" position allows for a 2-ampere charging rate, if the battery needs boosting.

AUTOMATIC CONTROLS

We have always the human element to contend with and it too often happens that we forget to put our storage battery on charge when it should; or, if we have "B" eliminators, we forget to turn them off when finished with the set. Thus, the wise manufacturers offer us automatic controls, so that we can forget entirely about our batteries and eliminators. In using one of these, all you have to remember is to turn your set off. When you have done that, the "B" eliminator or "B" batteries are automatically disconnected and the storage "A" battery is disconnected from the set proper and is hooked up to the charger, which immediately commences operation. These little devices are practically fool-proof and it is not necessary to make any radical changes in the wiring of the "B" eliminator, the storage battery or the charger. Any set owner should be able to connect one of these automatic controls to his receiver in a few minutes.

The illustrations of Figs. 20, 21 and 22 show three different makes; all serve the same purpose and differ materially only in appearance. Needless to say, these little automatic controls require no attention.

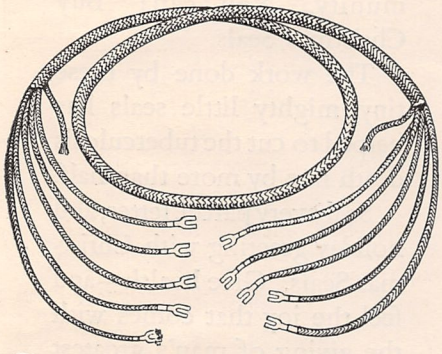


Fig. 23. A five-wire battery cable, which will take care of the principal connections from the set to the batteries.
Illustration courtesy of Birnbach Radio Co.

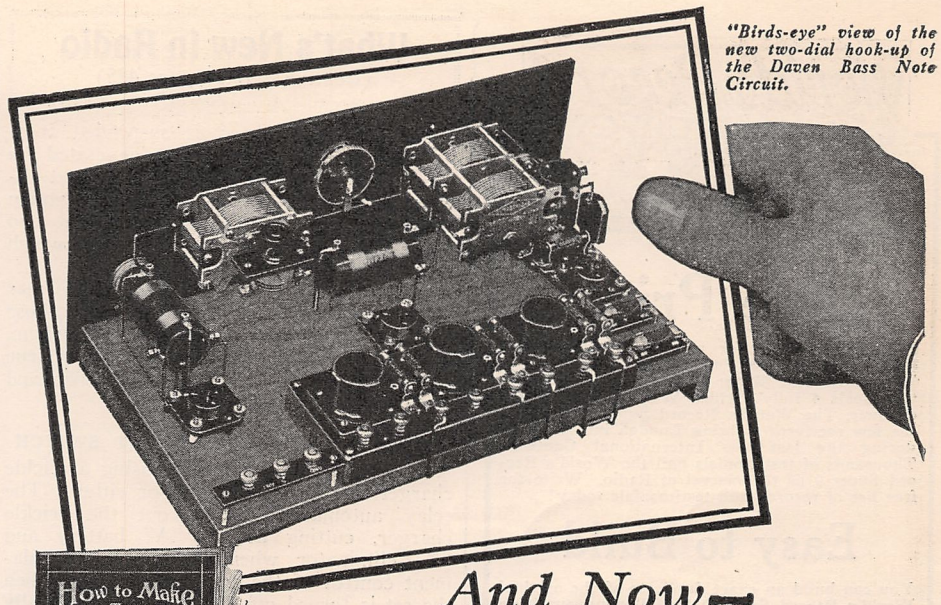
BATTERY CABLES

No matter what we do there is always the chance of making a mistake and this is particularly true in connection with radio. One can increase the safety factor by employing a battery cable, such as the one shown in Fig. 23. In the first place, all the wires are sheathed in one covering and are well insulated from each other. There is very little chance of their being harmed; and the very fact that they are bunched together is an advantage as far as the electrical characteristics of a radio set are concerned. Each wire is differently colored and otherwise marked; so that there is very little opportunity of anyone making a mistake in connections from the set to the "A" and "B" batteries. And, certainly, a battery cable is neater in appearance than a jumble of separate wires.

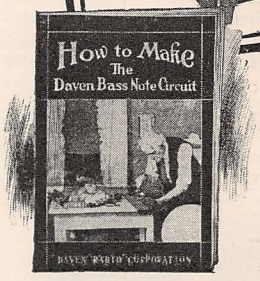
The battery cable shown in Fig. 24 has an added feature; a fuse box containing one fuse in the "B" battery wire, and another in the "A" battery wire. Should you make a mistake, one or the other fuse will blow; thus opening the particular circuit in which it is connected and preventing any damage to the set or apparatus used in conjunction with the set.

THE GREAT OPEN SPACE

Nevada is the only state not having a broadcast station at latest reports.



"Birds-eye" view of the new two-dial hook-up of the Daven Bass Note Circuit.



And Now—
The Bass Note Circuit *in a* 2-Dial Hook-Up

CLEARER than ever—even more selective—and always that crystal purity of tone—from highest soprano down to deepest, richest bass. The same astonishing Daven Bass-Note Circuit—with new refinements added.

For instance, *Two tuning dials only*—instead of the usually accepted three. An R.F. choke coil that prevents the radio waves from entering the audio amplifier. A special compensating condenser that increases selectivity, especially in long-distance tuning. And a brand new layout, requiring less base space and a smaller, neater panel.

READ "HOW TO BUILD THE BASS-NOTE CIRCUIT"

A brand new booklet that tells you in the simplest, clearest way how to make yourself a Daven Base-Note Receiver. And a wireing diagram of an altogether *new type*—a boy can follow it clearly—shows you quickly how to assemble the parts. 25c per copy at any Daven Dealer's—or 30c by mail. And it's worth ten times as much in the new kind of radio reception it will help you obtain. Get your copy *now*—while the edition is plentiful—later on, you might have to wait for another printing.

DAVEN GLASTOR
the new Transparent Resistor. Enduring, noiseless. Changeless. Complete range of resistances.

DAVEN HI-DUTY GLASTOR
Specially designed for B-Eliminators. Will carry highest currents known to radio.

DAVEN
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For Complete Radio Reception

"The Sine of Merit"
DAVEN RADIO CORPORATION
Trade Mark *Resistor Specialists* Registered
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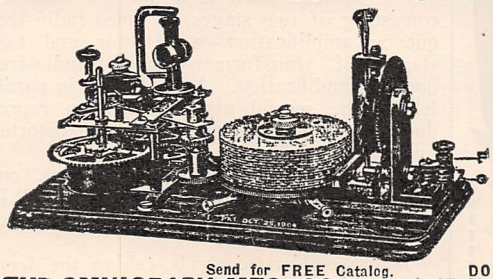
Daven Catalog Free on Request.

NEW EDITION DAVEN MANUAL
This valuable Book explains Daven Amplification in full detail, and shows how to apply it to your set. 25c *at Daven dealers',* 30c *by mail.*

LEARN THE CODE AT HOME
WITH THE OMNIGRAPH



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What's New In Radio

(*Continued from page* 485)

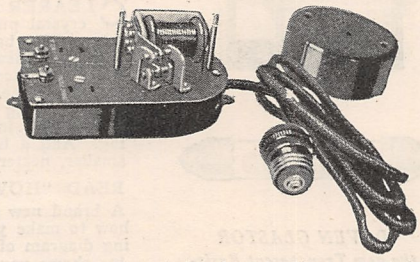
ten inches in diameter, is suspended from its apex. The sound waves generated by the vibrations of the cone are forced towards the cloth-covered front by reflection from the rear wall of the casing and also from the concave side of the cone which faces the front.

The reflection of the tones from the rear of the speaker's case, combined with those received directly from the cone diaphragm, make this speaker's reproduction very true and pleasing. It is finished in bronze and the height is 13½ inches.

AN AUTOMATIC POWER-UNIT SWITCH

This switch is for the set using a trickle charger and "B" eliminator, or either. The relay automatically cuts out the trickle charger, cutting in the "A" battery and "B" eliminator when the switch or filament control of the set is turned on. When the set is turned off, the relay automatically cuts out the "B" eliminator and "A" battery, cutting in the trickle charger again.

The relay is used in connection with the radio receiving set for the purpose of switching such devices as trickle charger,



This automatic switch, when the filament switch is opened, puts the "A" battery on charge and disconnects the "B" source.

Photo by courtesy of Yaxley Mfg. Co.

"B" eliminators, etc. It may be used to connect and disconnect a trickle charger or a "B" eliminator where either one is used separately in connection with the set; or to connect and disconnect both the trickle charger and "B" eliminator by simply operating the filament switch of the set.

Where a trickle charger and "B" eliminator are used without such a relay, it is necessary to go through several operations before the set is completely switched in for use. For the installation of a trickle charger and "B" eliminator controlled with this relay, the operation of the set remains exactly the same as it was before these units were installed; that is, you turn the set on and the relay automatically takes care of the "B" eliminator, trickle charger and "A" battery.

A "REACTION-STABILIZED" 6-TUBE RECEIVER

The model shown is a six-tube receiver consisting of two stages of tuned-radio-frequency amplification, a detector and two stages of transformer-coupled audio-frequency amplification. A sixth tube in parallel to the second audio assists in reproducing radio broadcasting of undistorted quality plus volume.

There are three tuning condensers, one for the aerial tuning, and two for the T.R.F. stages. They are of the straight-line-wavelength type.

Two secondary controls, taking the form of rheostats, are also mounted on the front panel; one regulates the filaments of the detector and two audio stages, and will be found very useful in obtaining the desired quality. With certain types of tubes it will also assist in stabilizing the entire receiver.

The volume control is a specially designed

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GIVE health as a Christmas present—to yourself, to every member of your family, and everybody in your community. You can! Buy Christmas Seals.

The work done by these tiny, mighty little seals has helped to cut the tuberculosis death rate by more than half.

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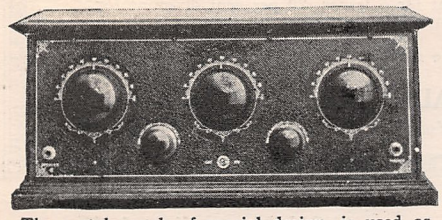
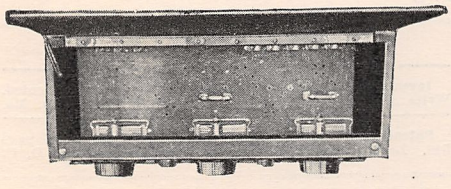
rheostat of 8 ohms resistance, the proper value to allow a smooth-working control of volume over a wide scale. It is connected in series with the two R.F. filaments and directly controls the radio-frequency input to the detector circuit.



The metal panel, of special design, is used as an aid in shielding this receiver.
Photo courtesy of Standard Radio Corp.

The front panel is of etched metal, which materially aids in shielding the receiver. In designing the radio-frequency transformers a combination of windings was developed that allows maximum amplification over the entire broadcasting range without affecting the selectivity. A third winding is interlinked in each of the R.F. transformers; this is the "reacted winding." In the second transformer it is shunted by a special resistance of approximately 10,000 ohms which forms the stabilization factor of the receiver, as a coil shunted by a high resistance will form an absorbing circuit of high decrement, effective over a wide scale of frequencies.



Everything except the variable condensers is mounted on or under the sub-panel. The holes for the tubes may be seen at the rear.

By inserting resistances of different values this receiver can be adjusted so that no oscillation will occur at any dial setting. However, the receiver can be brought close to the point of oscillation without spilling over. Maximum volume and selectivity can thus be obtained without interfering with the quality. Any tendency for the receiver to oscillate may also be controlled by adjusting the volume control.

AMAZING STORIES IN THIS ISSUE: NOVEMBER, 1926

"THE FIRST MEN IN THE MOON," by H. G. Wells. This is undoubtedly one of the greatest moon stories ever written. It is safe to say that only a Wells could imagine such amazing creatures and describe them so vividly.

"THE MAN HIGHER UP," by Edwin Balmer and William B. MacHarg. An engrossing story of experimental psychology, involving the reading of the mind by means of a detecting apparatus.

"THE TIME ELIMINATOR," by Kaw. This is a scientific love story. By utilizing light waves produced in the remote past, the events of preceding centuries and years are thrown upon a screen and a bride is won.

"THE LORD OF THE WINDS," by Augusto Bissiri. A great scientist has a project for controlling the climate of the hemisphere, but the inventor eventually perishes when approaching his triumph.

"THE EDUCATED HARPOON," by Charles S. Wolfe. This is a wonderful detective story.

"THE SECOND DELUGE," by Professor Garrett P. Serviss. The second installment of this engrossing story.

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TO the thousands of readers who are looking forward to the pages of bargains carried in these columns in former years, we announce a new policy. The growth of radio has been so rapid that we have found it impossible to list the thousands of items in ordinary ads—we have been compelled to issue a large 164-page BUYER'S GUIDE for the purpose. In it you will find everything that pertains to radio—complete factory-built sets, parts, supplies and accessories, fully described, illustrated and priced at tremendous savings—without doubt the largest collection of standard high-grade radio merchandise ever assembled in the industry.

Our latest edition is just off the press, brimful of the best approved standard complete factory-built radio sets, parts and kits at savings that will appeal to the thrifty. Shows the new radio merchandise, such as power packs, amplifiers and other recent radio improvements. Be sure to get your copy before you spend another cent for sets, parts, and radio supplies.

Valuable Information Free

It gives information about the newest and most advanced ideas in radio development, describes and illustrates the latest improvements. It will keep you posted on what's up to date. It will help you to build a better set or buy a complete modern one. Also shows hundreds of new items of merchandise at big savings, such as electrical and wiring material, household appliances, auto supplies.

All Newest Circuits Described

Shows latest hookups and information, completely illustrated. Every radio set owner, amateur, beginner and fan should have a copy.

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You need this book before you spend another cent on radio. Just mail the coupon and free copy will be sent you. Also please include name of a friend interested in radio to whom we can send free copy also.

The Barawik Co.
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Send me my copy of your 1927 Radio Catalog and Builder's Guide.
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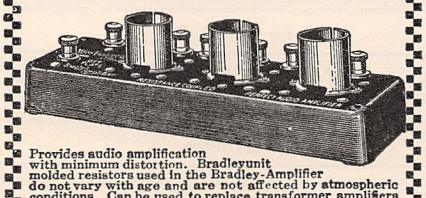
Resistance-Coupled
PERFECT AUDIO AMPLIFIER



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We Start You In Business, Furnishing everything. Men and Women, opportunity to earn $40.00 to $100.00 weekly operating Ragsdale's original "New System Specialty Candy Factories" anywhere; wholesale or retail. Valuable commercial candy book free. W. Hillyer Ragsdale, Drawer 210, East Orange, N. J.

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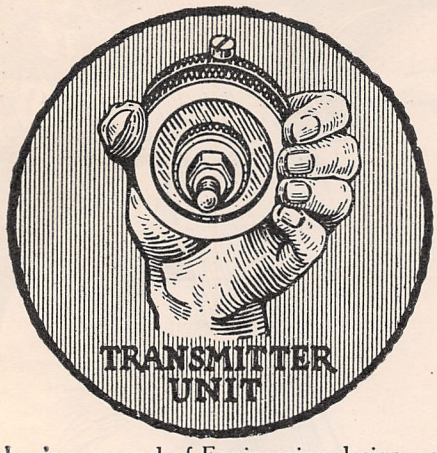
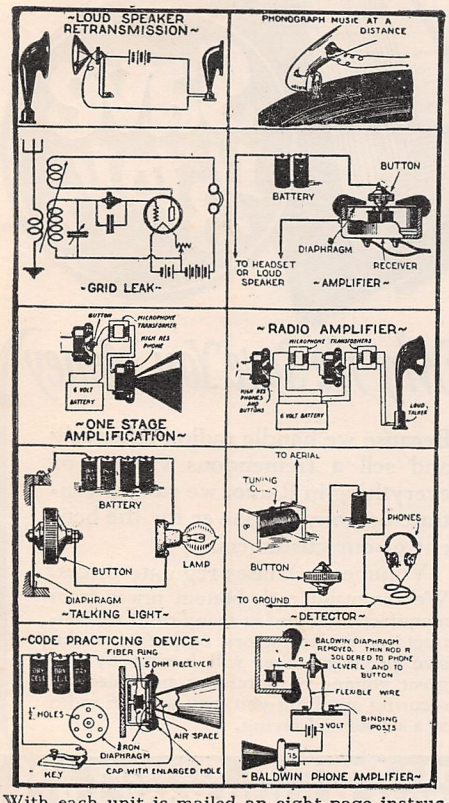
Build Super using Davisco Long Wave air core transformers and standard parts. Selectivity unparalleled, freedom from interference, tone unsurpassed, volume equal to power amplifier. Long range loop reception. Entirely new principle in Super-Het. Ask for literature, blue prints 50 cents. We can furnish parts to commercial set builders at special discount. Davisco, 30 Euclid Arcade, Cleveland, O.

Thousands Use These Ingenious TRANSMITTER UNITS



Here's a marvel of Engineering design—a practical miniature transmitter, used by thousands of radio fans and experimenters for amplification purposes.
It is a most novel unit, having hundreds of uses. Every amateur should have two or three of these amplifiers in his laboratory.

A FEW USES FOR THESE UNITS



With each unit is mailed an eight-page instruction pamphlet containing suggestions for innumerable uses.
Our supply is limited; avoid disappointment by ordering today. The coupon below is for your special convenience.

SPECIALLY PRICED

While they last— (or Two for $1.75) **95c** per unit

THE PRESS GUILD,
66-R West Broadway, New York, N. Y.
Enclosed find 95c/$1.75 for which send me postpaid one/two amplifier units as advertised.
Name .....
Address .....
City, State .....

Radio (Continued)

Build a Lifetime "B" battery from my better Edison Elements. With welded connections 7c pair. Sample cell 10c. Paul Mills, Woodburn, Oregon.

Representatives Wanted

Sales representatives wanted in all principal cities for the new Westerland Super-Vernier Tuning Dial and Station Finder. Sells at $2.50. A real advance in fine tuning. Attachable to any dial set. A whirlwind seller. Excellent sideline. Exclusive territory. Commission basis. Westerland Corp., Dobbs Ferry, N. Y.

Salesmen Wanted

A Salesman wanted in every town or city within 25 miles of a broadcasting station to sell Radiogem, the complete radio receiving set that retails for $2.50. With Radiogem there is nothing else to buy—the outfit includes the Radiogem receiving apparatus, 1,000 ohm-phone, and aerial outfit. The cheapest radio outfit on the market—yet as practical as the most expensive. Big money to the right men. Send $2.00 for sample outfit. The Radiogem Corp., 66-R West Broadway, New York City.

Make $100 Weekly in spare time. Sell what the public wants—long distance radio receiving sets. Two sales weekly pays $100 profit. No big investment, no canvassing. Sharpe of Colorado made $955 in one month. Representatives wanted at once. This plan is sweeping the country—write today before your county is gone. OZARKA, INC., 431 N. LaSalle, Ave. K, Chicago.

Gold Wave Aerial. Greatest Side Line out. Guaranteed to bring in more stations—gives greater distance and selectivity. Reduces static to a minimum. Sell all dealers handling radio. Unlimited field. Big commissions and re-orders. Luxem & Davis Mfg. Co., 6231 Broadway, Dept. 62, Chicago.

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World's Most Beautiful Settings for operas, plays, minstrels. Amelia Grain, Philadelphia.

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Electricity—Short day or evening courses in Electricity, Drafting, Engineering, and Architecture. In Chicago earn while you learn. Part Time positions pay expenses. Faculty of experts. Special short courses. Diplomas in 2 years. B.S. Degree in 3 years. Small classes, individual instruction. 23 year old institution with thousands of successful graduates. Enter any time. Employment bureau. Moderate tuition—monthly payments. New College building—all athletics. All details in 72 page "Blue Book." A copy will be sent to you free. Write today. Chicago Technical College, Dept. 27, 118 E. 26th St, Chicago, Ill.

Song Writers

Song-poem writers. Address Monarch, 1472 Broadway Dept. 122, New York.

Song Writing

Songwriters! Substantial Advance Royalty Payment essential to publication contract. Expert advice furnished beginners upon receiving poems requiring musical settings and copyright protection for free examination. Send today. Walter Newcomer, 1674 Broadway, New York.

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Stop Stammering. All speech defects successfully corrected. Samuel Robbins, 309 Boylston St., Boston.

St-tut-t-t-tering and stammering cured at home. Instructive booklet free. Walter McDonnell, 121 Arcade, 1126 Granville Avenue, Chicago, Ill.

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Telegraphy—Both Morse and Wireless taught thoroughly. Big salaries. Wonderful opportunities. Expenses low, chance to earn part. School established fifty years. Catalog free. Dodge's Institute, Cour St., Valparaiso, Ind.

Wanted to Buy

Full Value Paid for Old Gold, Jewelry, Watches, Diamonds, crowns, bridges, dental gold, silver, platinum, gold or silver ore; magneto points, old false teeth. Packages returned if our offer is not satisfactory. United States Smelting Works (The Old Reliable) 39 So. State St., Dept. 16, Chicago, Ill.

The Truth About ASTROLOGY

If You Believe in Astrology
If You Do Not Believe in Astrology
If You Want to Know More About Astrology

DON'T FAIL TO SEE PAGE 494
November issue
SCIENCE AND INVENTION

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Many Earn $60 to $200 a week

Think of your future today. Don't let marriage and responsibilities find you holding a small pay disagreeable job, at $25.00, $30.00 or $40.00 a week. Have the good things in life. Prepare for a big pay job in the most interesting, fascinating work in the world. You may be a clerk, mechanic, farmer, bookkeeper, laborer or a white collar man, still Electricity offers you unlimited possibilities. Salaries of $60.00, $70.00 and $100.00 and up a week are paid to Electrical Experts. Many others enter business on a very small capital and make up to $10,000 a year.

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I haven't space here to tell you of the advantages of my training. But I'll send YOU ABSOLUTELY FREE my big new book, size 12 x 15 inches, with over 150 actual photographs and success stories of my graduates. It tells you about my LIFETIME EMPLOYMENT SERVICE after graduation and how you can EARN YOUR EXPENSES while attending my school and all about my offer of FREE RAILROAD FARE to those enrolling now. It tells you facts that will amaze you. You owe it to yourself to get these facts. FILL IN THIS COUPON AND MAIL TODAY.

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Coyne Electrical School, H. C. Lewis, Pres.
1300-1320 W. Harrison St., Dept. 66-77 Chicago, Ill.
Dear H. C.—I sure want to get all the facts. Send me that big, handsome 12x15 inch book. Of course, I'm under no obligations and it doesn't cost me a cent.

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Get the New 1926-27 Van-Ashe Catalogue—

Shows all the newest parts, circuits and kits—all the hard-to-get items that set-builders demand. 12-hour shipments — extra-good discounts. Mail the coupon.

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This 84 Page Wonder Book of RADIO Bargains

Send for this guide to Radio prices and Radio quality. All of our vast resources and radio experience have been utilized to assemble for you in one gigantic institution, the best and newest things in radio. The Randolph catalog is indeed the radio market place of the world — a masterpiece of merchandising that befits our house—**the largest exclusive radio mail order house in the world.**

Save 1/3 to 1/2

What Our Catalog Contains

Over 2,000 items—from the most beautiful, fully equipped console model radio set, down to the smallest part or tool for the set builder—kits, parts, and supplies of every conceivable type and style. All beautifully illustrated and interestingly described. And to give this book added value, we have included radio data that makes it an invaluable text book for every lover of today's most fascinating and most wonderful achievement—RADIO.

Radio Sets

In this great radio market place you will find table model sets and console types with built-in loud speakers; the newest ampliphonic console sets; new Spanish period consoles; **five, Six, seven, and eight tube sets.** with three dial, two dial, and the **newest and most popular single simplified control.** All sets are assembled in beautiful, genuine mahogany and walnut cabinets in a choice of latest types and designs.

5 Tube sets as low as $24.90
Latest 1927 Models

All Randolph sets are sold at amazingly low prices. No matter what kind of set you want—no matter how little you want to pay—you can select YOUR SET AT YOUR PRICE from the Randolph catalog.

Radio Kits

The radio kits we offer for sale are approved by the world's foremost radio engineers. Wonderful values in the latest kits, including all classes of radio frequency, super-heterodynes and every other approved popular and advertised circuit. There is nothing in the line of radio kits and parts of any value and which are in demand which we do not carry.

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The Randolph catalog also contains a most complete line of **"B" Battery Eliminators.** including the famous **Raytheon Eliminators;** the latest type of Loud Speakers, Cone Speakers, a complete line of quality "A" power units — in fact, you will find listed in this wonder book every part that goes into the construction of a radio set, or any accessories you desire, at prices that mean a **substantial saving to you.**

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Everyone has need for radio service. The average man has no time to keep up with the rapid developments of radio. We employ Radio Engineers who have made radio their life work. Their expert advice and helpful suggestions solve every radio problem of our customers.

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Every article in our catalog is based on careful laboratory analyses and tests. We guarantee to back up every item in our catalog with our own as well as manufacturer's assurance of quality.

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Space limitations here prevent our telling you more about the Randolph Catalog. Simply fill out and mail the coupon—or you may send a postal or letter—and this truly remarkable Radio book will come to you **ABSOLUTELY FREE. MAIL THE COUPON NOW.** ☞

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Because we handle radio exclusively and sell a tremendous volume of everything in Radio, we can concentrate our buying power for the benefit of our customers.

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Send me—free—your 84-page, 1927 Radio Book.

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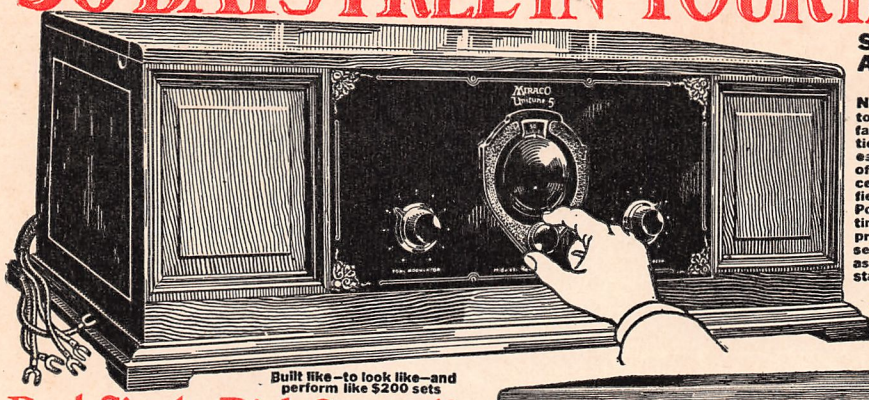
30 DAYS FREE IN YOUR HOME

Tested and approved by all of Radio's Highest Authorities



Built like—to look like—and perform like $200 sets

Send Coupon for Amazing Special Offer!

NOTE: This offer is made to prospective buyers by famous big Radio Corporation, one of America's oldest reliable manufacturers of fine sets—seventh successful year. Many satisfied users in every state. Postal or coupon brings testimony of nearby users and proof Miraco 's outperform sets costing up to 4 times as much. Very easy to install and operate.

AMAZING SPECIAL OFFER to User-Agents who will allow friends to listen to their Miracos.

BEAUTIFUL-BIG-POWERFUL Ultra Selective MIRACO Ultra 5s

Retail LIST Price $49.75 now only

GET SPECIAL OFFER

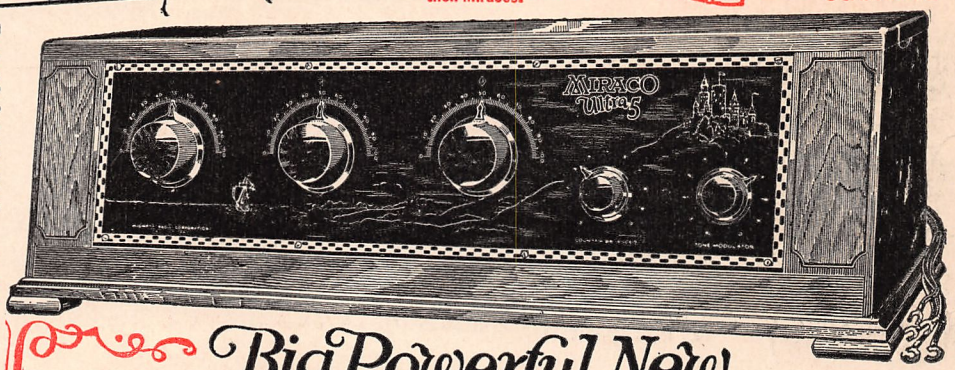
One year GUARANTEE

Real Single Dial Control!

Magnificent Big Powerful Miraco "Unitune-5" Retail List price only $87.50–get special offer

The celebrated Miraco Ultra-5—U.S. Navy type circuit, has also been adapted to Single Dial Tuning—**without sacrifice of selectivity, volume, clearness, power, tone, or distance getting qualities!** In the magnificent big Miraco Unitune-5, above shown, you turn one vernier knob for stations everywhere. Beautiful hand-rubbed, piano hinged, solid walnut cabinet, 28 in. long, 15 in. deep, 10 in. high. Sloping Bakelite panel is walnut finished to match. **Also offered on 30 days free trial!**

Coast to Coast and Foreign Reception Certified by Miraco users



MIRACO RADIO GETS 'EM COAST to COAST

Send for Proof!

Notice! Enormous sales of the celebrated Miraco 5-tube Receivers (resulting from delighted users so highly endorsing them to friends) again enable us to add hosts of costly new features, latest refinements and up-to-the-minute improvements such as you might expect to find only on much higher priced sets. Miraco's this year are still better—more beautiful—more selective—more powerful for less money than ever before.

USER-AGENTS WANTED - - WRITE!

Reports from users everywhere leave little for us to add. These are only a few of the many in our files and which we receive daily. Send coupon for plenty of additional proof and testimony of nearby users.

CUTS OUT LOCAL, GETS PROGRAMS EVERYWHERE. Meridan, Miss. Everyone says my Miraco 5 is the best set they have heard. It gets stations all over the States, also Mexico, Cuba. Have a broadcasting station next door but it doesn't matter with the Miraco 6. I get them just same. H. B. Sandefer.

COAST TO COAST THRU LOCALS

Omaha, Nebraska Miraco is a wonder for distance, volume, tone. We have 5 local broadcasting stations here and she goes right thru and brings them from coast to coast. No trouble at all. H. N. Eller.

BEATS OTHERS FOR SELECTIVITY. Cleveland, O. Have been up against some pretty good radio men with other sets and this receiver has them guessing. In selectivity, volume and range it has outdone several. We were able to cut out WTAM (powerful local station) in 3 points, to bring in other stations. W. C. Pike.

"UNITUNE" SEPARATES CHICAGO LOCALS. Chicago, Ill. With 4 local stations broadcasting less than a mile away, one after another I can tune and keep separated as high as 15 Chicago stations on your "Unitune-5". Even during the summer I frequently got stations clear and loud on speaker as far away as Colorado, New Jersey, New Orleans and many others. With the single dial I switch from one to another station in an instant. The selectivity is amazing, the set is a beauty and the tone is perfect. W. H. Schaeffer.

FLORIDA GETS CAL. FIRST NIGHT Daytona Beach, Fla. Tuned in 45 stations the first night ranging throughout Florida, Cuba and as far as California with Miraco 5. Monte Rankin.

OHIO HEARS THEM COAST TO COAST. Westerville, O. We have to our credit about 85 stations from CFCF Montreal, Canada to British Columbia, Canada. WIOD Miami Beach Fla; two stations in California; a station at Seattle, Wash. We are more than pleased with the Miraco 5. Dan Groce.

HONOLULU TO LONDON FROM IOWA. Anthon, Iowa. Here are some of the stations we picked up on the Miraco 5 Sunday Jan. 24 between 10 and 11 P. M.: 2LO London, KYO Honolulu, Hawaii; WKAQ San Juan, P. R. and one station in Ireland; could not get call letter. John Kuhn.

NEW YORK LOGS 163 STATIONS Buffalo, N. Y. I received 2LO London, 11:05 on Monday night but there was so much interference it was not very plain. I also have logged 163 stations in U. S. and Canada. A satisfied user of Miraco. Norman W. Ives.

NEBRASKA HEARS PORTO RICO ON SPEAKER. Spencer, Nebr. Using the Miraco 5 we have often heard Mexico City, Porto Rico, Miami, Florida, Ottawa, Canada and Vancouver, B. C., Canada and all along the Pacific Coast. All the above stations on the speaker. Have also heard Lima, Peru, South America. H. J. Schmidt.

TEXAS GETS 'EM N. Y. TO CAL. Waco, Texas. In less than a week after I instal ed the Miraco-5 I tuned in on the loud speaker New York City: Oakland, Calif; Minneapolis. Minn. Mexico City, several stations in Florida and many others. E. E. Sitz.

TONE, VOLUME, DISTANCE. Elbing, Kans. We like our Miraco fine especially because of its volume, tone and its freedom from howling. Although I do not try much for distance we received programs from Oakland, Cal.; Los Angeles, New York, Miami and Havana. Mrs. E. A. Regier.

MIRACO EQUALS $240 SET Onaka, S. D. Miraco works fine. Selective and plenty of volume. Stations logged include Winnipeg, Canada; PWX, Havana, Cuba; and CYL, Mexico City, Mexico. Have heard quite a few sets, one costing as much as $240, but can't see where it is any better. Clarence Ruach.

NO HOWLS---SUPERIOR TO COSTLY SETS. Modoc, Ind. We certainly enjoy our Miraco-5. Results equal to any radio I ever heard and far superior to most radios costing a great deal more. All stations come in loud and clear on the loudspeaker. James Tullis.

OUTPERFORMS 6 AND 8 TUBE SETS. Duncansville, Pa. I don't think there is a better receiving set made than a Miraco-5. Stations received--all on the loudspeaker--include KFI, Los Angeles, Calif.--distance, 2,250 miles. I got this on loudspeaker plain, when others couldn't get it with 6 and 8 tube sets. Also have heard Can., Colo., Fla., Cuba, Neb. and many other states. S. D. Fowkes.

OREGON HEARS 'EM FAR AND CLEAR. Chiloquin, Ore. A few stations I have heard very clear on Miraco include California, Denver, Colorado; Hasting, Lincoln, Nebraska, Chicago, Louisville, Kentucky; also Catalina Islands. Cyril W. Benson.

CALIFORNIA HEARS PENNA. ON SPEAKER. San Rafael, Calif. I have purchased three of your sets and will give you an idea of what the Miraco-5 does out here. I have logged 86 stations, which I can get nearly any time I try. Mexico City on the South to CFCN, Calgary, Canada, on the North, with Honolulu to the West and E. Pitts., Pa., to the East. All on loud speaker, clear and plain. Roy F. Sharer.

CUTS THRU POWERFUL LOCAL. Pontiac, Mich. The Ultra-5 is sure a wonder. I live 1-4 of a mile from WJR a 5000 Watt Station and can cut through with ease and receive distant stations. During the International Test Week I received 2LO London, England; also CZE Mexico City, Mex. I have received stations from WMBF Miami Beach, Florida to KFI Los Angeles, Calif. In conclusion I'll say it's everything you claim it to be. Very truly yours, Edward J. Elking.

Big Powerful New MIRACO Ultra 5

Solid Walnut Cabinet — Unitune 5 — 28 in. long

TRADE MARK REGISTERED

Solid Walnut Cabinet — 27 in. long

ULTRA-SELECTIVE LONG DISTANCE 5 TUBE SETS EASY ON BATTERIES

SAVE or **make** a lot of money on sets and accessories by writing immediately for our **Amazing Special Offer!** It will astonish you. Unless 30 days' trial proves a Miraco the most selective, clearest toned and most powerful distance-getter among beautiful big 5-tube sets, don't buy it.

Send for Testimony of Users Everywhere

First, reports of delighted users will assure you that the beautiful, big Miraco's actually are unsurpassed (even at much higher prices) for razor-edge selectivity combined with extreme long distance reception, clear natural tone and powerful loud speaker volume, plus economy in use of battery current.

Second, it is our honest conviction—based on seven years' successful experience in building fine sets—that these latest Miraco's are the most marvelous values offered in high-grade receivers.

Third, convince yourself by using a Miraco thirty days in your home before you decide to keep it.

You'll Be Proud of Your Miraco!

Each Miraco comes completely assembled, rigidly tested, splendidly packed and factory guaranteed for one year. Easy to install and operate—full instructions supplied. A big, handsome, expensive-looking radio—one you'll be proud to have friends see and hear. Stylish, sloping front cabinet of solid walnut, handsomely gold illustrated genuine Bakelite front panel and genuine Bakelite knobs—finished in walnut. In construction, too, like high-priced sets. Finest parts obtainable—and many exclusive features. Literature describes them fully—send for it, testimony of nearby users and Special Offer!

Deal Direct with a Big, Reliable Firm!

Thousands of satisfied customers can testify to the money they've made and saved by dealing direct with the great Midwest Radio Corporation. You are absolutely guaranteed and assured the same satisfaction. Clip coupon now and be convinced!

Our Factory Prices Save You Up to 1/2! Facts About Makers of Miraco's:

To our many thousands of satisfied users throughout the world, we require no introduction. But those who have never enjoyed the pleasure and satisfaction of operating a Miraco Set, will undoubtedly wish to be assured that the makers of the Miraco are thoroughly reliable. We therefore present these facts about the Midwest Radio Corporation of Cincinnati, Ohio:

1. One of America's oldest, largest and most experienced builders of fine sets—seventh successful year.
2. Builds all sets complete in its own big factory and thoroughly tests them under actual broadcasting conditions before shipping.
3. Sells all sets on a Guarantee of Unconditional Satisfaction, allowing liberal trial privilege.
4. Deals direct by mail with its users, agents and dealers, thereby effecting great savings which are reflected in amazingly low prices.
5. Keeps all promises to the letter. Highest references from users, bank officials and all concerns with whom we have dealings. We have been customers of a big $3,000,000 Cincinnati bank for many years. In our literature read what they say about our responsibility and reputation for square dealings.

AGENTS! DEALERS! Write for our latest Miraco proposition. Nation-wide popularity, superior performance of Miraco 5-tube sets, at amazingly lower prices, make them easy to sell. Send coupon today for proof

All the Proof you want is waiting for You!

Coupon or postal brings reports from hosts of users in your vicinity and elsewhere proving that Miraco sets **at rock-bottom money-saving factory prices,** outperform sets costing up to four times as much. **You can also buy speakers, tubes, batteries, etc. at big savings from us!** Get our proposition before spending money elsewhere.

Send coupon for Amazing Special Offer

MIDWEST RADIO CORPORATION
Pioneer Builders of Sets
Cincinnati, O.

404-M Miraco Building

Without obligation, send free literature, testimony of users, AMAZING SPECIAL OFFER and full particulars of your **big money-saving factory-price proposition** on Guaranteed Miraco sets and all radio supplies. ( ) Agent ( ) User ( ) Dealer

NAME

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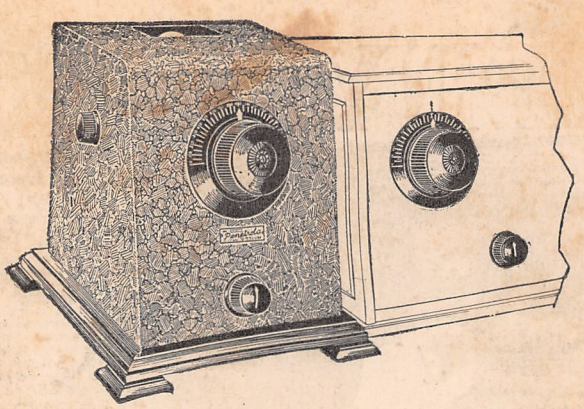

Double your stations—

Penetrate interference—

Cut through locals by adding Penetrola to your present radio set

Penetrola transforms your old radio set into a powerful up-to-date receiver. It gives greater range and volume and real selectivity. It stops radiation and "blooping." It is easily attached and operates with any set.

Hitherto, if you have wanted greater range and power than your radio receiver could deliver, there was nothing to do but discard your old set and buy a new one.

This is no longer necessary. Now you can add Penetrola—the unique radio "booster"—to the receiver you already own. Provided you have a fairly good set to begin with, the resulting combination is a powerful up-to-date receiver that in most cases will out-perform any set on the market. It will add more in performance than many times its cost in a new set.

Penetrola increases range and power. It penetrates distance and interference and gives real selectivity. In many cases it will double and triple the number of stations received.

Here's an instance: WCAL and WCBD could not be separated on a certain receiver. They came in together at 47 on the dial. On the audibility meter WCAL showed a signal strength of 35, WCBD a signal strength of 29. Penetrola was added. WCAL jumped to a signal strength of 2,000 while WCBD went to zero. *WCBD was entirely eliminated, while WCAL came in with signal strength increased 57 times.*

Endless similar instances could be quoted from letters received from the thousands of satisfied Penetrola users.

Penetrola increases clarity and quality of reception also. It makes operation near the oscillation point unnecessary. It stops your set from radiating and "blooping." It stabilizes reception.

Penetrola is not a wave-trap. It is the first step of amplification of the most advanced radio set on the market—the Walbert Isofarad. Penetrola makes this new and revolutionary circuit available to those who already own a radio set. Connected between the aerial and the receiver, it selects and amplifies signals before they reach the set. In effect it brings the station you want close to your receiver and rejects all others.

Penetrola can be added to your set in a few minutes. It requires no changes, no other additions, and no extra batteries. It uses a standard radio tube. It is a permanent investment, for it will operate with any type of set—either the one you own now, or any you may buy in the future. And no matter how fine a radio receiver you now own, Penetrola will improve it.

Add Penetrola to your set now. Practically all dealers have it. If, however, you are unable to obtain it, write to us direct. Satisfaction is guaranteed or your money will be refunded.

PRICE

$35

Prices slightly higher West of Rockies and in Canada

Penetrola is manufactured by the makers of the Walbert Isofarad Receiver—the most advanced radio receiver on the market. If you do not already own a radio receiver, let us tell you about the Isofarad with Penetrola built-in.

If your dealer can't supply you Mail the Coupon

Walbert Manufacturing Company, 911 *Wrightwood Avenue,* Chicago
Walbert of Canada, Ltd., London, Ontario

Walbert *Penetrola*

Walbert Manufacturing Company
911 Wrightwood Ave., Chicago

Gentlemen:

Enclosed please find check or money order for $35 for which please send me one Walbert Penetrola. If at the end of 7 days it does not perform to my entire satisfaction I will return it and you will refund my money.

☐ Loop type ☐ Outdoor aerial type
(Check which type of set you own)

☐ Send me complete information about the Walbert Isofarad receiver without obligation.

*Name*_____

*Address*_____

RN